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MACHINERY ISSUE

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THE IRON TRADE REVIEW

Vol. LX Cleveland, March 1, 1917 No. 9

Foreign Crisis Stirs Steel Market

Manufacturers Prepare to Supply Demands of the Government for Iron and Steel Products—Little Revealed Concerning Federal Purchases But Large Tonnages are Involved—Prices Advance During Week

WHEN only a superficial view is taken, the acute crisis in America's foreign relations has had little or no effect upon the iron and steel industry. Prices show the same tendency to seek new and higher levels; consumers, in most cases, exhibit the same freedom from any reluctance to purchase commodities at figures that seemed fantastic only a few months ago. Outwardly the sinking of an Atlantic liner or the sounding of a warning note at Washington has not constricted the expanding demand.

"Armed Neutrality"

Under the surface, however, the iron and steel industry is maintaining an "armed neutrality". The requests from Washington that both the manufacturers and the press refrain from spreading information regarding preparedness measures are being observed. Stray bits of information, which are released at infrequent intervals, show with great clarity that the government is figuring more actively in the market than is generally supposed. Some large producers, for instance, are now inserting in all contracts which they take, a proviso that government requirements will be given precedence over the needs of private consumers. An eastern interest, it develops, has taken a contract to supply heavy tonnages of wire for harbor nets. At Pittsburgh, considerable tonnages of shafting, it is believed, are being furnished to the government for manufacture into small fuses. The appearance of the federal authorities as active buyers of iron and steel products is certain to complicate the already serious problem of making the supply stand four-square with the private demand. Production of pig iron, as well as partly and fully finished steel products, for months has lagged well behind the needs of consumers. When one recalls how traffic congestion has immeasurably restricted the output of iron and steel and has thrown deliveries still further in arrears, the serious effects of a greatly enlarged government demand are clearly evident. Steel manufacturers, however, are laying their plans to meet any demands from Washington. Fortunately the railroads are slowly relieving the congestion of traffic on their lines and shipments long overdue are reaching their destination.

Pig Iron

The demand for spot pig iron, first observed a short time ago when the freight transportation crisis came to a head, continues to gain momentum. Special prices are being brought out for the little iron that is available for immediate or early delivery. The increased demand for iron is running counter to output-decreasing factors, such as irregular furnace operations, deferred deliveries of coke and serious delays in outbound shipments. The result has been a general strengthening all along the line. At New York, No. 2X is held at a minimum of $33, furnace. Virginia iron was sold at $33, tidewater, but prices now are at least $2 above that. One Virginia maker is holding for $36, furnace. Alabama No. 2 is entering the eastern market at $25, Birmingham, with fewer offers, while one sale was made at Cleveland at $26.50, Birmingham. Southern Ohio No. 2 has been advanced by one maker to $35, Ironton, and Chicago foundry and malleable are now $34.

Plates

The famine in ship plates is becoming increasingly serious. New business put out this week brought the total of inquiries during the past two weeks up to 300,000 to 400,000 tons. Japanese ship yards want 50,000 tons, Canada 10,000 tons, a Chester ship yard 8,000 to 20,000 tons. Prices have strengthened, sales being made in the east at above 6c, Pittsburgh. One foreign inquiry carried an entreaty that the mill "shade a price of 10 cents".

Finished Materials

Additional navy yard work for the government will require from 10,000 to 15,000 tons. The Curtis Publishing Co. building will take 8,000 tons. At Chicago, 6,500 tons are wanted for western mining companies. The leading interest at Chicago has taken some bar business for the first half of 1918. The shortage of lumber is hampering tin plate mills.

Tool Market Booms Despite Crisis

Submarine Campaign May Yet Hinder Shipments of Machines—Railroad Embargoes Complicate Situation—Electric Companies to Spend Millions For Equipment—Railroads Buy Freely

IN SPITE of the developments which tended further to complicate the shipping situation, the demand for machine tools for export reflected a marked improvement during February. The institution of so-called "barred zones" around the allied countries was expected in some quarters to result in a decreased volume of foreign shipping, with a consequent accumulation of machine tools, at seaport terminals in this country. The situation thus arising from the German submarine campaign, promised later in the month to be rendered still more complicated, owing to the decision of the leading railroads to embargo all shipments for export, excepting where speedy transfer of the goods to out-bound steamships was assured. It is too early to appreciate the full significance of this action by the railroads, but it is likely that an accumulation of machine tools, destined for export, will result at the points of production instead of at seaport terminals as heretofore. A good deal of export business has been done on the basis of f. o. b. seaboard, and it is possible that many builders will shortly be confronted with problems involving payment for their goods.

Domestic Business Was Heavy

In addition to the large export business, which came principally from France and England, and to a smaller extent from Spain, Italy and Japan, there was a steady call for machine tools from a variety of domestic sources. The most important requirements of the month for a single interest were embraced in a number of lists issued by the General Electric Co. This concern placed orders for more than $1,000,000 worth of tools for installation in its plants at Schenectady, N. Y.; Lynn, Mass.; Erie, Pa., and its proposed new plant at Bloomfield, N. J. The principal business closed by this company in February was comprised of approximately 150 heavy tools, including large boring mills, milling machines, radial drills, lathes and planers, involving an outlay of more than $75,000. A large proportion of this company's machine tool needs are still pending. Another large buyer in February was the Tennessee Coal, Iron & Railroad Co., which placed orders for general machine shop equipment, involving more than $100,000.

Westinghouse Issues Mammoth List

The huge requirements of the Westinghouse Electric & Mfg. Co., in connection with the enormous plant it is about to erect at Essington, Pa., appeared on the market and will be acted upon at an early date. Inquiries have been issued from the East Pittsburgh office of this concern for about 50 cranes of various capacities and for more than 200 machine tools, including 35 radial drills and a large number of lathes, planers, reamers and presses for installation at Essington. The Westinghouse interests also were reported as being on the verge of buying equipment for installation in a large new incandescent lamp plant to be erected at Trenton, N. J. Another new project announced in February was a new plant which is to be built by the American Bridge Co. at Trenton, N. J., but which is not expected to materialize for a few months.

Marine Interests Enter Market

Ship builders both on the sea coasts and the Great Lakes continued to be important sources of machine tool business. Probably the largest ship building requirements which came up in February were those of the Newport News Ship Building & Dry Dock Co., Newport News, Va., which placed orders for a number of large tools and in addition inquired on prices and deliveries in connection with a large list, which the company now has in contemplation. The Seattle Construction & Dry Dock Co. closed for a large list. Additional business of importance was placed by the William Cramp & Son Ship & Engine Building Co., Philadelphia.

Railroads Contribute Heavily to Total

A fair amount of business came from the railroads during February. These interests are adopting the policy of purchasing a few tools at a time instead of issuing and closing on large lists. As a result of this practice, spectacular transactions are not as numerous. The Great Northern, the Northern Pacific, the Union Pacific, the New York Central, the Pennsylvania, the Baltimore & Ohio, the Delaware, Lackawanna & Western, the Boston & Maine and many other roads furnished important contributions to the total during February. Among railroad inquiries pending March 1 are new lists issued by the Grand Trunk, New York Central and the Southern Pacific roads. The Chicago, Burlington & Quincy railroad recently materially reduced its large list of requirements, the principal cause being the general advance in prices on special railroad shop machine tools. The tools involved were power hammers, planers, boring mills, radial drills, etc., and the advances in most cases were 10 per cent, although some advances ranged from 10 per cent to 25 per cent.

Tool Prices Advance Sharply

Price advances, which became effective Feb. 1, were the first which have been applied to this class of equipment in a long time. Further advances, however, were made on general machine shop tools in February. In most cases price revisions applied to machine tools which had been quoted at prices averaging below those prevailing generally on the same class of equipment. That higher levels are expected to be reached before long, however, is reflected in the policy of a number of builders, and particularly by one maker of milling machines; this interest has advanced its quotations 10 per cent and in selling reserves the right to charge an additional 10 per cent in case of further advances before the tools are shipped.

As a result of the international situation, a large number of contracts for war munitions of various kinds already has been let by the government to private concerns and considerable buying of equipment has resulted. This business has been placed quietly, owing to the unwillingness of the national government to divulge any details at this time.

MEN OF MACHINERY TRADE

Who they are **Where they are** **What they are doing**

ALLAN J. BEATON, president and manager of the Beaton & Cadwell Mfg. Co., New Britain, Conn., has disposed of his interest in the company to William H. Cadwell and others and retired from the business. He has no definite plans for the future but is contemplating a vacation for his health. Mr. Beaton is one of the most widely known manufacturers in Connecticut, having been in business in various places during the past 23 years. William H. Cadwell, secretary and treasurer, who holds a controling interest in the company, will succeed Mr. Beaton as president.

O. R. Adams, Rochester, N. Y., has opened a salesroom for metal-working machinery.

W. L. Batt has been appointed sales manager of the Hess-Bright Mfg. Co., Philadelphia.

Arthur M. Watkins has been appointed treasurer of the Inter-Continental Machinery Corporation.

The Richardson Phenix Co., Milwaukee, has opened a sales office in Cleveland which will be in charge of W. J. Oettinger.

Joseph Froehlich, for the past 10 years superintendent and factory manager of the F. L. Schmidt shops, New York, has resigned.

C. R. Courtenay and R. E. Cahill have formed a company under the corporate style of the Watertown Engine & Machine Co., Watertown, Conn.

The Omar Machine Co., Chicago, has changed its corporate style to the Fulton Machine Tool Co., and has elected William Ganschow, president, and C. F. Goedke, secretary and treasurer.

At the annual meeting of the board of directors of the Baird Machinery Co., Pittsburgh, L. H. Allen retired as assistant treasurer and assistant secretary of the company.

G. B. Bassett, formerly connected with the machinery department of the National Supply Co., Toledo, O., has become affiliated with the machine tool sales force of the Cleveland Tool & Supply Co., Cleveland.

R. B. Holladay, formerly connected with the Fairbanks, Morse Co., Beloit, Wis., has resigned and accepted a position as assistant to the general superintendent of the Power & Mining Machinery Co., Cudahy, Wis.

W. D. Sayle, president of the Cleveland Punch & Shear Works, Cleveland, has left for the Pacific coast. Mr. Sayle expects to make an extended trip through California, returning to Cleveland in April.

Edward J. Kearney, secretary and treasurer, Kearney & Trecker Co., builder of milling machines, Milwaukee, has been appointed a member of the Wisconsin state board of industrial education by Governor E. L. Philipp.

Paul R. Ketzer, formerly eastern manager for the Metalwood Mfg. Co., Detroit, has resigned from that position and formed the Ketzer Machinery Co., Philadelphia. Mr. Ketzer will handle a wide line of special machinery and machine tools.

R. W. Boland has retired from the Birmingham Machine & Foundry Co., Birmingham, Ala., and has disposed of his interests in that concern. Mr. Boland came to Birmingham in 1877 and started the business with two employes.

The Birmingham Machine & Foundry Co., Birmingham, Ala., has elected the following officers for the ensuing year: George M. Morrow Jr., president; R. I. Ingalls, vice president, and Robert Ritchie, secretary and treasurer.

Henry D. Sharpe, president of the Brown & Sharpe Mfg. Co., Providence, R. I., has been elected a director of the New England Telephone & Telegraph Co., in place of Vice President E. K. Hall, who resigned to go to New York.

F. E. Traphagen, general foreman of factory No. 2 of the Vallorber Jewel Co., Lancaster, Pa., has resigned to become general foreman of the machine shop of the American Machine Tool Co., Hackettstown, N. J.

Fred Ziegahn has been elected president of the Chippewa Foundry & Machine Co., Chippewa Falls, Wis. The company, which began operating Feb. 1, elected L. J. Vaudreil, vice president, and P. T. Favell, secretary and treasurer.

J. B. Weaver, formerly connected with the Newport News Ship Building & Dry Dock Co., has been made vice president and general manager of the Harlan & Hollingsworth Corporation, Wilmington. He succeeds Persifor Frazer, who resigned several months ago.

The Quality Saw & Tool Works and the Napier Saw Machinery Works, both of Springfield, Mass., have formed a company under the corporate style of the Napier Saw Works; the following officers have been elected: Charles Napier, president; F. T. Sey, vice president, and C. H. Parsons, treasurer.

R. W. Van Horn has been transferred from the New York branch to the home office of the Berger Mfg. Co., Canton, O. Norman A. Hill, formerly efficiency engineer for the Du Pont Powder Co., Wilmington, Del., has taken a position as efficiency engineer with the Berger Mfg. Co.

The Allied Machinery Co. of America, 120 Broadway, New York, recently tendered a dinner of welcome, attended by a number of machine tool builders, to C. E. Carpenter, who returned from France where he had been in the interest of the Allied Machinery Co.

Mr. and Mrs. Edgar Bloxham, French representatives in Paris for the Kempsmith Mfg. Co., Milwaukee, recently visited the home office of that company to arrange for next year's shipment of tools. Mr. and Mrs. Bloxham are the sole French representatives for the Kempsmith company.

Elmer Kechler, chief engineer, was recently appointed master mechanic of the Franklin steel works of the Chicago Railway Equipment Co., Franklin, Pa., to succeed J. S. Green, resigned. Mr. Green has become associated with the Wickwire Steel Co., Buffalo, and will aid in the installation of its new plant.

The Pratt & Whitney Co., Hartford, Conn., has elected the following officers for the ensuing year: James K. Cullen, Hamilton, N. Y., president; Thomas T. Gaff, Washington; A. C. Stebbins, Plainfield, N. J.; B. M. W. Hanson, Hartford, and C. L. Cornell, New Jersey, vice presidents; and J. N. Cornell treasurer.

H. D. Savage, vice president of the American Arch Co., New York, has been made manager of sales of the industrial department of the Locomotive Pulverized Fuel Co., with offices at 30 Church street, New York. Mr. Savage formerly was sales manager of the Ashland Fire Brick Co., Ashland, Ky. He retains the vice presidency of the American Arch Co., to which he was elected in 1914.

New Stack

Of Iroquois Iron Will Be Constructed at Once

Chicago, Feb. 27.—Construction of its fifth blast furnace stack will be started at once by the Iroquois Iron Co. The site is being cleared. It will be located 180 feet east of the present No. 4 stack and will be known as No. 5. This location will necessitate adding 340 feet of dock, which will be largely reinforced concrete.

The new furnace is designed to give a daily output of 550 to 600 tons. It will have a hearth diameter of 18 feet 6 inches, bosh 22 feet 6 inches, 17-foot stock line and will be 92 feet high. The blast will be heated by means of three stoves, 22 feet in diameter and 100 feet high. The fabricating for the new unit will be done by John Mohr & Sons Co. The Great Lakes Dredge & Dock Co. will have charge of the dock construction. Plans have been laid to have the new stack in operation early in 1918.

Heinrich J. Fryn, Inc., is engineer in charge. Plans are being prepared in the same office for a blast furnace stack of similar size and design for the new plant of the Mark Mfg. Co., at Indiana Harbor, Ind.

Tin Plate Prices High

Pittsburgh, Feb. 27.—Small lots of tin plate are being sold at as high as $8.25 per base box for nearby shipment. Scarcely any tonnage is available, however, for delivery before July 1 next. Books for delivery in the third and fourth quarters of the year will probably not be opened until May 1. Long terne plate is commanding from $7 to $7.50, base.

The situation for tin plate has been complicated further by what is described as an acute scarcity of lumber for boxing material. Several manufacturers have accumulated heavy tonnages of tin plate, which cannot be shipped because of deferred deliveries of lumber. Boxing departments at some mills have been made idle temporarily owing to the inability of lumber shippers to meet specifications for shipment.

New Bethlehem Mill

New York, Feb. 27.—The Bethlehem Steel Co.'s policy of rounding out its structural shape production at South Bethlehem, Pa., is shown in the recent completion at its Saucon plant of an 18-inch, 3-high mill of three stands and in the construction of a 12-inch mill now under way. These mills will augment the output of the present Bethlehem shape mill and the standard 28-inch mill. The 18-inch mill is equipped with traveling tilting tables and is designed to roll medium-sized angles, beams, channels, etc., to fill in and to lap the smaller sections rolled on the 28-inch mill. The 12-inch mill, which consists of six 16-inch stands roughing and four 12-inch stands finishing, will produce the lighter sections of angles, beams, channels, rounds, flats, etc.

Changes Name

Toledo Company is Reorganized—Bearing Company Expands

Toledo, O., Feb. 27.—The Toledo Screw Products Co. is the new name of the former Toledo Screw & Stamping Co. The concern was reorganized recently and the business in the future will be strictly confined to manufacturing screws and screw products, stamping department having been discontinued. The machine department has been trebled and new hand and pneumatic machinery installed. Following the removal of the firm to a new office structure, Thomas H. Tracy Jr. was appointed sales manager. Pratt E. Tracy continues as manager.

The Mather Spring Co. is working both night and day shifts. The company's output of alloy-steel springs has increased until 90 per cent of the company's business is in this product.

A new 4-story building adjoining the present factory of the Bock Bearing Co. has recently been completed and new machinery and equipment is being installed. The concern will have four times the floor space it had in the old building and the working force will be doubled as soon as the equipment is installed. The company now employs 400 men. The Bay Terminal Railway Co., a local connecting line between the Wheeling & Lake Erie and the New York Central railroads, has increased its capital stock to $300,000. Most of the money will be used to increase the rolling stock of the company and for other improvements.

Will Not Build Ovens for Some Time

Concentrating its efforts upon the early completion of new bar mills at McDonald, O., and a by-product coke oven plant at Clairton, Pa., the Carnegie Steel Co. likely will not undertake to erect new retort coke ovens at the Ohio Works, Youngstown, for an indefinite period. Originally, the company planned to build the Youngstown coke batteries in 1916, but temporarily abandoned the project because of the pressure for its finished products and the scarcity of skilled employes.

Coke Prices

Recede Slowly at Pittsburgh—Spot Foundry at $12.50

Pittsburgh, Feb. 28. (By wire.)—Prices for furnace coke for spot delivery continue to recede slowly. Fuel has been sold today at $11.50, ovens, or $2 a ton below the price prevailing last Saturday. Spot foundry coke is commanding $12.50 and above. Heavy tonnages of cupola fuel are being sold for shipment after July 1 at $7, ovens. That figure, however, is regarded as low by many sellers who are quoting $6.50 to $7 for contract furnace coke. Prices of coal have declined about 50 cents a ton for spot shipment, but gas coal still commands as high as $6 a ton at the mine. While the traffic situation has improved, a shortage of cars still exists, say traffic managers.

Rebuild Old Stack

Work of rebuilding the old Vesta blast furnace of the Susquehanna Iron Co., at Watts, near Marietta, Pa., has been undertaken by E. J. Lavino & Co., Philadelphia, who recently acquired the property. The old Aurora furnace at Wrightsville, Pa., which also was purchased by the same interest, is being wrecked and part of its equipment is being used in the rebuilding of the Vesta furnace. It is probable that it will be utilized for the production of ferro-manganese, spiegeleisen, etc., which now is being conducted by the Lavino interests at the Sheridan, Pa., and at the Lebanon valley furnace at Lebanon. The Vesta and Wrightsville furnaces were last active in 1903.

New J. & L. Furnace

The Jones & Laughlin Steel Co., Pittsburgh, plans to complete and blow in No. 6 Eliza blast furnace early this summer. The Treadwell Construction Co. is furnishing two hot blast stoves, and the Otis Elevator Co. is installing the skip hoist. The blast furnace, which will have a rated capacity of 500 tons, is being built almost entirely by the Jones & Laughlin Co.

New Lackawanna Stack

New York, Feb. 28. (By wire.)—The Lackawanna Steel Co. is awarding contracts for the construction of another 500-ton blast furnace at Buffalo. This will add 175,000 tons annually to the company's capacity and will increase the number of its Buffalo group to eight. The new furnace is expected to be ready by January, 1918.

Latest Reports on Traffic Conditions

Pittsburgh

THE railroad traffic situation at Pittsburgh has been improving gradually in spots, shipments of fuel being now much better. Although normal conditions do not yet exist, consumers and shippers generally believe relief is in sight. Extremely favorable weather conditions have enabled the railroads to clear their tracks in the Pittsburgh district. The supply of hopper and rack cars in the Connellsville coke regions during the last 10 days has been much more satisfactory. The Carnegie Steel Co., for instance, has been able to put the blast on all but one of the 13 blast furnace stacks, idle a week ago because of deferred coke deliveries. Enough coke is in transit to furnish fuel for all the active blast furnaces in the district. Gondola and box cars are just about as scarce as ever. Accumulations of finished materials in mill yards and on shipping platforms have not been reduced appreciably, some mills having 85,000 tons of finished products awaiting arrival of cars or motive power. The Pennsylvania Lines West has lifted its embargo against shipments west of Pittsburgh, and material is moving freely over railroad lines connecting with St. Louis, Chicago, Youngstown and Cleveland. The Conway yards of the Pennsylvania railroad, which have held 10,000 cars, now are described as open.

In the East

THE scarcity of raw materials in the east, due to the traffic congestion, is not now as acute as during the last few weeks. Carloads of various materials, including coal, coke, pig iron, steel, lead, spelter, lumber, etc. —in some cases in transit for four months and more—are reaching their destinations. In some cases, the effect has been to wipe out or to lower the premiums asked on material available for spot delivery; for instance, spot lead in New York, dropping from 10.50c to 11c per pound to 10c to 10.25c. The improvement in most cases, however, has not been so pronounced. Many concerns continue to work out emergency transportation methods. A large concern with a plant on a Maine river, which ordinarily is not navigable at this time of the year, last week broke a lane through ice 8 inches thick in order to receive barges loaded with coal. A concern in Boston, finding itself on the point of having to shut down its plant, due to the lack of tin cans, has instituted a cross-country service and now is bringing cans all the way from Baltimore in motor trucks. Now that the railroads have refused more freight for export unless assurances are given that it will be transferred to a steamship without unreasonable delay, weather conditions will probably be the prime factor in the traffic situation, and, since the weather lately has shown a tendency to moderate, continued improvement is expected.

Cleveland

COKE is entering Cleveland more freely. Some embargoes have been raised, although probably for only a short time. The recent improvement in traffic conditions has already afforded considerable relief. Team work also is lightening the burden of both manufacturer and railroader. For instance, one big Pittsburgh coke company is sending coke to the Conway yards of the Pennsylvania railroad, where a train is made up and started for any available point. The coke company then bills its customers in that city. Considerable thought is being given to the aftermath of the traffic congestion. In the first place, the decision of the railroads to refuse freight consigned abroad tends to pile up materials at producing plants. This clogging up is not the manufacturer's only problem; the question of payment also is involved since it has been the custom in some instances of late to sell goods for export on the basis of f. o. b. ocean terminal. Another factor is that when the traffic congestion first became restrictive, buyers of all kinds of raw materials started to place orders on a larger scale than usual. By increasing the amount of material consigned to their plants, these buyers hoped to receive a part of the shipments without undue delay and at the same time insure future supplies. But the result is that raw materials en route (especially in the east) are the greatest in history.

Chicago

RAILROAD traffic conditions in Chicago have been as bad as could be imagined for some weeks, but the coming of warmer weather has decreased the tension and offered an opportunity to untangle the snarl somewhat. The main difficulty has been that efforts have been concentrated on moving coal to the comparative neglect of other classes. Steel mills and allied industries have managed to get through the pinch with comparative comfort, though its effect has been felt. Owing to lack of coal for coke-making, two blast furnace stacks of the Illinois Steel Co. at South Chicago and one at Milwaukee have been banked. One stack at the Federal furnace, South Chicago, is banked. Foundries have been hard pressed for coke and scrap owing to delay in delivery of cars. Motor trucks have been resorted to in some instances to keep up a supply. The Thomas Furnace Co. at Milwaukee is using trucks for transporting slag and coke and also for local delivery of pig iron. Inability to ship agricultural implements threatens interference with farm planting unless the embargoes are removed before seed-time is past. Should the machinery be left much longer on manufacturers' hands, manufacturing operations next year will be curtailed. Embargoes against export material have changed rolling schedules and earlier deliveries are hoped for.

THE OPEN HEARTH

The Case for the Government

THE brief filed by government counsel in the dissolution suit against the United States Steel Corporation, referred to briefly in these columns last week, uncovers few points that have not been brought up before in this long drawn out legal contest. The government's arguments against the great Corporation's legal existence were threshed out thoroughly during the original argument before Judge Buffington and his associates in the federal circuit court. This hearing resulted in a finding against the government on almost all of its contentions.

In the main, the new brief is an elaboration of the government's original contentions which had to do with the size of the Steel Corporation and, therefore, its potentialities either for good or evil in the iron and steel trade; also with the form of its organization many years ago. The brief indulges in speculation pure and simple as to what might have been the course of iron and steel prices under the sharply competitive system which obtained in the middle and late nineties, and also as to whether the Steel Corporation, because of alleged dominance at one time of the iron and steel markets—through its own problematical power or through fear of possible exercise of that theoretical power—did dominate the steel trade and thus keep prices above the level that, thoretically, might have been called normal when compared with the unnatural and abnormal price levels that obtained throughout the greater portion of the decade immediately preceding the formation of the Steel Corporation.

In all of these contentions of government counsel before the various courts which have listened to them, it seems that the ogre which has confronted the learned gentlemen representing the United States has been thinner than a man of straw, merely a breath of suspicion. They have delved into some facts and figures with the result that their vision has been obscured. What they should have studied, examined and conned over was the one identical thing they appear all along to have overlooked, that is, the unusual, abnormal and likely never-to-be repeated manufacturing and economic conditions which enshrouded American industry and trade in the decade 1892-1902. Such a study would have accounted for more seemingly inconsistent things in the American iron and steel trade of that decade and of the one that followed it than any amount of study of mere tonnages, price figures, sizes of works, etc. In fact, the lower federal court actually took into account these economic studies of the American iron and steel trade, these very unusual and abnormal things which went to make up American iron and steel trade history prior to the formation of the Steel Corporation, and that court found for the defendant.

Versatile in Face of Difficulties

NEARLY three years of war have proved that the American iron and steel industry is versatile in the face of difficulties, and even in the unexpected event of the shutting off of all foreign supplies of manganese, magnesite, etc., production would proceed practically without interruption. Although it is true, as D. F. Hewett of the geological survey pointed out at the recent New York meeting of the American Institute of Mining Engineers, that this country is woefully deficient in manganese, enough progress already has been made in the use of substitutes and in the double reduction of lean manganiferous ores to point the way out of the difficulty. At the present time, serious consideration is being given to magnesium as a steel deoxidizer, although first the dangers inherent in the use of the pure metal must be eliminated.

In other directions, the American steel industry is preparing for any emergency. Already it has been discovered that valuable potash by-products may be recovered from blast furnace residues and this has led to the suggestion that blast furnaces be employed primarily for the manufacture of potash, without attempting to make any pig iron. If this idea could be worked out, useless slate piles in the Pennsylvania anthracite regions would be transformed into valuable sources of raw material. Another characteristic American development is found in the use of roll scale to increase production and cut down costs in the bessemer process. All along the line, changing situations are being met with confidence and energy.

Training for Prisoners

STUDENTS of sociology find cause for encouragement in the report submitted to the New York commission on new prisons by the representatives of organized labor. The findings of the commission recommend a radical departure from the general conception of retribution to the state for crime. The members of the commission advocate the rehabilitation of Sing Sing and other state prisons to permit the proper segregation of criminals and the establishment of industrial schools to train the inmates of the institutions in the various skilled arts. If the prisons will undertake the task of giving the men a training equivalent to that of free apprentices, organized labor pledges itself to take the men into

THE OPEN HEARTH

the unions and to assist them to secure employment without discrimination.

This altruistic scheme is the first practical plan that organized labor has offered in lieu of the use of prison labor for either state or private revenue. The hostility of the working class to the sale of convict labor which destroyed competition and tended to throw the free man out of employment was justified. The result of this objection, however, was to enforce idleness upon the prisoners. This was unfair to the prisoner because it eliminated any opportunity for him to prepare for his self-support at the end of his sentence. State use of convict labor has not been altogether successful, for, it is pointed out, this plan was based on the desire to save money for the state rather than to save men for society.

The new plan meets the demand that the work of the convict should not be brought into open competition with that of the free worker. In addition to this, it provides occupation for the prisoners and trains them in a useful trade which will benefit them and the community upon their release. The spirit of revenge which has characterized the penal laws of the country is eliminated and in its place is inaugurated a system of reclamation rather than of destruction.

In the Good Old Days

THE *Philadelphia Record* has reprinted its issue of June 1, 1877, claimed to have been the first one-cent daily newspaper in the country. In the police court news of that date appeared the following item:

"As early as five o'clock yesterday morning Daniel Hill almost broke his back in carrying off $40 worth of pig iron from the gas office, adjoining the Tenth district station house, and now he is speculating on his chances with a jury."

This is offered in corroboration of the assertions of old-timers that men were stronger and healthier and went to work earlier in those days—and had no more respect for the police than prevails now. This man must have been strong and healthy, for pig iron was worth a little less than $20 in Philadelphia in 1877, and so he had to carry a little bundle of two tons.

Disraeli said: "Assassination has never changed the history of the world." Neither has a match, but if we are to believe the testimony offered by some eminent Teutons, like the match, assassination has produced some startling results. At all events, we expect the last 30 months will receive some mention in history, and perhaps, after all, Disraeli was right.

Spot Iron and the Submarine

NUMEROUS curious twists of trade and industry have been the logical outgrowth of the unparalleled iron and steel conditions of the past two years. None has seemed so out of step with expectations and precedent as the persistent failure of a spot market in pig iron to make its appearance. Demand for immediate necessities has at no time reached the point of general pressure such as would be likely to produce a spot market. Most of the buying of this kind has been sporadic and has lacked vigor. In contrast with previous great buying movements in iron, spot deliveries have commanded no premiums in price over forward positions. If anything, they have been less firm owing to the occasional offerings of speculative and resale metal. Furthermore, there has been much evidence that the extent of forward buying of iron has been regulated by fears of coming shortages as well as by actual requirements.

Production of merchant iron has been meeting immediate needs without strain, while the steel side of the industry constantly has been getting into greater difficulties to hold its own against the incessant demand for tonnage. One main point of difference between the conditions in pig iron and steel appears to be that the export demand and shipments in steel reached an unprecedented volume for that metal, long before they did in pig iron. In 1915 we exported considerably less iron than we did in 1912 and 1913, whereas our foreign steel shipments in 1915 were from 20 to 35 per cent greater than in the previous years stipulated and more than 500,000 tons greater than any other year. The foreign movement of iron made up some of this lost ground in 1916. Shipments increased by 273 per cent over 1915; in steel they were raised by 174 per cent.

In what duration of time these outside subtractions from the domestic supply, other conditions being equal, would have produced a spot market for iron, is a purely conjectural point. That they would have brought about this end sooner or later, there is no doubt. Prevailing operating difficulties among the furnaces by cutting down production now have hastened the cumulative effect of foreign pig iron shipments.

A spot market in iron is developing. Its continued growth and its prices, apparently, will be determined largely by the capacity of the transportation agencies to maintain the recent export movement. Nothing is more likely to chill an incipient spot market than railroad freight embargoes and shrinking vessel room, which have been rendered more acute by the German submarine menace.

Prices Present and Past

(Yesterday, a month ago, three months ago and a year ago.)

Quotations on leading products February 28, average for January, 1917, average for November, 1916, and average for February, 1916. Prices are those ruling in the largest percentage of sales at the dates named.

	Prices Feb. 28, 1917.	Aver. for Jan., 1917.	Aver. for Nov., 1916.	Aver. for Feb., 1916.
Bessemer pig iron, Pittsburgh...	$35.95	$35.95	$30.35	$21.45
Basic pig iron, Pittsburgh.....	30.95	30.95	25.95	18.77
No. 2 Fdy. pig iron, Pittsburgh	35.95	31.95	26.75	19.51
Northern No. 2, Fdy., Chicago.	34.00	30.00	25.00	18.50
Lake Superior Charcoal, Chgo..	35.75	33.75	21.95	19.50
Malleable, Chicago	34.00	30.00	25.00	19.00
Southern No. 2, Birmingham...	25.00	23.00	19.60	14.63
Southern Ohio No. 2, Ironton..	35.00	30.00	24.00	18.00
Basic, eastern Pa.....	30.50	30.50	25.50	19.50
No. 2X Virginia, furnace.....	32.00	26.50	23.75	18.00
No. 2X foundry, Philadelphia...	33.50	30.50	25.25	20.00
Ferro mang., delivered.....	275.00	175.00	155.00*	140.00*
Bessemer billets, Pbgh.....	65.00	60.00	52.00	34.00
Bess. sheet bars, Pbgh.....	65.00	60.00	52.00	34.00
Op.-h'th sh. bars, Pbgh.....	65.00	60.00	52.00	35.00
Open-hearth billets, Pbgh.....	65.00	60.00	52.00	35.00
Steel bars, Pittsburgh contract..	3.00	2.975	2.78	2.01
Steel bars, Chgo.....	3.19	3.19	2.89	2.23
Iron bars, Philadelphia.....	3.159	3.159	2.659	2.259
Iron bars, Cleveland, local del'y.	3.00	3.00	2.70	2.29

*Seaboard.

	Prices Feb. 28, 1917.	Aver. for Jan., 1917.	Aver. for Nov., 1916.	Aver. for Feb., 1916.
Iron bars, Chgo. mill.....	$3.00	$3.00	$2.52	$1.91
Beams, Chgo. contr.....	3.44	3.29	3.03	2.22
Beams, Pittsburgh, contr.....	3.25	3.075	2.88	2.03
Beams, Philadelphia	3.659	3.509	3.109	2.209
Tank plates, Pbgh., contr.....	3.75	3.575	3.35	2.13
Tank plates, Chicago, contract..	3.94	3.98	3.46	2.33
Tank plates, Philadelphia.....	5.159	4.909	4.159	2.659
Sheets, blk., No. 28, Pbgh.....	5.00	4.56	3.67	2.60
Sheets, blue anl., No. 10, Pbgh.	4.75	4.125	3.30	2.61
Sheets, galv., No. 28, Pbgh....	6.75	6.56	5.07	4.75
Wire nails, Pittsburgh.....	3.00	3.00	2.85	2.22
Connellsville fur. coke, contr...	8.00	7.25	3.75	2.50
Connellsville fdy. coke, contr...	6.50	6.375	8.60	3.75
Heavy melting steel, Pbgh.....	23.00	23.25	20.55	17.37
Heavy melting steel, eastern Pa.	22.00	21.50	19.50	16.50
Heavy melting steel, Chgo.....	22.00	20.25	19.35	15.25
No. 1 wrought eastern Pa.....	27.50	26.50	24.00	22.50
No. 1 wrought, Chgo.....	25.00	23.75	21.25	14.95
Rerolling rails, Chgo.....	26.50	27.25	24.90	17.12
Car wheels, Chgo.....	18.50	19.75	15.95	14.06

(For Additional Prices See Page 552.)

Demand for Iron Increases in East

Prices Tighten as Eastern Buying Movement Gains Momentum—Spot Pig is Sought More Actively—Export Demand Continues Unappeased—Western Pennsylvania Furnaces Resume as Traffic Congestion Abates

New York, Feb. 27.—Renewed buying of iron is spreading easily but none the less perceptibly in this territory. Demand is well divided between first and second halves with an increasing amount of spot trading—some of which is bringing higher prices than for forward shipment. The early supply of iron is restricted and some buyers who were seeking first half delivery have been obliged to accept later positions. Prices generally are more buoyant. The minimum eastern and central Pennsylvania prices for No. 2X now seem to be $33, furnace, or $33.74 to $35.16, tidewater. Some eastern Pennsylvania makers are up to $35, furnace. Virginia iron was sold in the week at $33, tidewater, but prices now are at least $2 above that. A small lot of spot Buffalo for New England went at $38.08, delivered, or $35.50, furnace.

There have been also some resale offers of Buffalo iron bought some months back by consumers who are disposed to take advantage of the profits from these purchases. This has produced a wide range of prices with as low as $27, Buffalo, reported, but the effect has not been disturbing. A Torrington, Conn., buyer closed for 2,000 to 3,000 tons of foundry and now wants 500 tons of malleable; a New Jersey soil pipe maker is credited with a purchase of several thousand tons of low grade; a 3,000-ton foundry inquiry for western delivery is out here. Various New Jersey buyers have been placing 500 tons and less. Connecticut malleable consumers have indicated their interest in spot iron. Export trade has been backward because of the shipping situation.

The recent inquiries for pig also are not so heavy but a new request from Italy out today calls for 20,000 tons of low phosphorus and 10,000 tons of southern foundry. A Portuguese inquiry for 5,000 tons of low phosphorus and 3,000 tons of foundry has been satisfied but the buyers have not indicated how this was done. Holland wants 900 tons and Australia 500 tons of foundry. Japan still is figuring on 3,000 tons of low phosphorus. A 5,000-ton malleable inquiry for export is pending. Some export lots tied up at tidewater continue to be offered for resale. Holders do not seem anxious to make concessions upon these, however. On 5,000 tons of bessemer offered here this week, $40, tidewater, was asked.

Sharp Upturn in East

Philadelphia, Feb. 26.—A sharp upward spurt both in new demand and in prices, during the past week, has more clearly defined the importance of the new buying movement in pig iron in this territory. Spot and early buying has been figuring more prominently and is beginning to command special prices. Irregular furnace operations, record-breaking coke prices and backward shipments remain important market factors. Some improvement has been made in getting long overdue coke shipments through congested freight areas. New inquiry has shown the chief change and the pending lots have increased to 30,000 to 40,000 tons. The National Radiator Co. wants 6,000 tons of No. 2X for last half; the Baldwin Locomotive Works, 3,000 to 5,000 tons of low silicon, April-August delivery; the Standard Cast Iron Pipe & Foundry Co., 5,000 tons of forge and No. 3, second quarter; a Trenton sanitary ware manufacturer, 1,500 tons of foundry; a Reading shop, 2,000 to 2,500 tons; another buyer 1,800 tons. The smaller lots are numerous. Two east-

(*For complete prices see page 552.*)

ern Pennsylvania makers have put the No. 2X price at $35, furnace, and one has sold several hundred tons at that figure. For spot, $36 furnace is asked by one maker and a small sale is reported. Spot carloads also went at $34, furnace. From other eastern Pennsylvania makers $33, furnace, still is obtainable. Virginia iron has moved upward again. One maker wants $32, furnace, or $34.75, Philadelphia, as a minimum; another has adopted $34, furnace, for No. 2X and has sold high silicon at $34.75, furnace. The leading Virginia maker who has been out of the market has fixed $36, furnace, as his lowest selling price. Buying of Alabama iron on an unusual scale by eastern Pennsylvania consumers has continued because of the attractiveness of the price. A $25 Birmingham quotation has represented about $30, delivered, eastern Pennsylvania. About 10,000 tons of southern iron in smaller lots recently have been sold in this territory, it is estimated. A price of $25 on southern iron now is not easily obtainable and business at that figure has been refused by makers. Some furnaces have been quoting $26 to $27, Birmingham, but warrant iron has been offered lower. A Cumberland, Md., steelmaker bought 2,000 to 3,000 tons of spot basic at about $33.75, delivered, or $32, western Pennsylvania furnace. No basic business has been done in eastern Pennsylvania. A 400-ton resale of Buffalo malleable was at $37.50, delivered, this district or $35, furnace. Standard low phosphorus remains exceedingly scarce around $60, Philadelphia. Some makers ask that price at the furnace. The 2,500-ton inquiry of the Midvale Steel Co. is believed to have been satisfied. A shortage of ore is reported in the Virginia district. The Buena Vista furnace has gone out for repairs.

Pig Iron Prices Hardening

Pittsburgh, Feb. 27. — Beset with traffic restrictions imposed by the railroads, blast furnace managers are struggling to maintain operations and to meet the insistent demands of melters. Shipments of Connellsville coke this week have been much more satisfactory than previously, although deliveries of iron, on the other hand, have reflected little improvement. Deferred shipments have driven numerous consumers into the market for spot iron, which has caused prices to advance slightly. No. 2 foundry iron for immediate delivery has commanded $38, valley. For future shipment, sales of this grade are being made at $35 and $36, valley. Inquiries for delivery after July 1 involve about 10,000 tons of foundry iron. A radiator interest in western Pennsylvania is negotiating for 6,000 tons for shipment in the second half. Bessemer pig iron generally is being held at $36, valley, and basic iron is firm at $30, valley.

Several prominent sellers of southern foundry iron, who have been active factors in this market recently, have advanced prices $5 a ton to $30, Birmingham, for No. 2 for second half delivery. Heavy tonnages of southern, southern Ohio and Virginia iron are being melted in this district. Purchases of resale iron in eastern territory have in no way affected the situation here. It is likely that some bessemer iron sold for export will be offered to the domestic trade, unless vessels leave the eastern seaboard in larger numbers.

The Miami furnace of the Hamilton Iron & Steel Co., Hamilton, O., is reported to have been taken over by several Pittsburgh capitalists. The furnace, built in 1907, has an annual capacity of about 100,000 tons.

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Small Lot Sought

Buffalo, Feb. 27.—With off-grade iron selling at the furnaces at $35, and $37 to $37.50 being obtained for the higher silicon grades, the market for the past week has been one of increasing inquiries for small lots for prompt shipment. A few sales have been made when the producers have been able to meet the demands of regular customers.

The basis for the small lot inquiry is said to arise from the holding up of iron under contract by the freight blockades, and from melters who have been consuming iron in excess of their contract tonnage. Little iron made in this district is obtainable at the present time. It is stated, however, that available lots of foundry iron are being placed without difficulty at $37, furnace. The railroad situation is slowly improving. The sales which have been made are reported to have been made within the range of $35 to $37.50, regardless of grade differentials.

Grades Being Ignored

Cleveland, Feb. 27.—The demand for pig iron continues greatly to exceed the tonnage which furnaces can supply. Most of the producers are practically sold out for the remainder of the year and can supply only a fractional part of the tonnage for which inquiries are received daily. Foundry iron is quoted by one producer at from $36 to $38, furnace, and second half iron at $35, valley. This interest sold a tonnage of No. 3 foundry this week at $35 and is holding to this price regardless of the grade of iron. Another sale is reported to have been made this week at $31, furnace. At the same time 1,000 tons of No. 2 southern foundry for third and fourth quarter delivery were taken this week at $26.50, Birmingham, the highest price yet reported. One Cleveland agency sold more southern iron in the month of February than in any entire year in its history. Less attention is being paid to the old differentials between grades.

Chicago Market Advances

Chicago, Feb. 27.—Northern pig iron, both foundry and malleable, was advanced Feb. 24 to a basis of $34, furnace, which has been firmly established. Some sales of small lots for immediate delivery have been made this week at $34.50, furnace. Inquiry is not heavy, but sales are being made steadily, mostly for second half delivery. The present sales are not of sufficient volume to be called a buying movement, and most consumers are conservative in their purchases.

The southern market seems to be entirely closed against all buyers. So far as can be learned no makers of southern iron are willing to quote at present and most of them indicate that they will be out of the market for some time. One interest recently quoted $30, Birmingham, on an inquiry for 3,000 tons for last half delivery. Some resale iron is reaching this market from the south at $26, Birmingham. A recent sale at this figure involves 500 tons.

Ferro manganese continues to be quoted at $300, Chicago furnace, for immediate and first quarter delivery. For second quarter the price is $250, and for third quarter, $225 per ton.

A recent quotation on 8 per cent silvery iron was $41.25, Ironton, or

(For complete prices see page 552.)

$43.75 delivered, Chicago. On bessemer ferro-silicon, a recent quotation was $53, Jackson county, for 10 per cent, $56 for 11 per cent, and $60 for 12 per cent. On the first two, shipment was offered in 60 to 90 days; on the 12 per cent, immediate delivery. Lake Superior charcoal iron is firm and strong, at about the level which has prevailed recently.

Southern Iron Up

Cincinnati, Feb. 27.—Southern Ohio No. 2 foundry iron has been advanced by one maker to $35, Ironton basis, for last half. No producers in that district are making quotations for the first half. Malleable and basic iron are scarce, most furnaces being out of the market on these grades. One maker has offered to sell a small amount of basic iron for the first half of 1918 at $38, furnace. Southern iron continues to hang in the balance. One maker is holding at $30, Birmingham basis, for No. 2 foundry for the last half, but $25, Birmingham basis, can be done for that delivery. The majority of furnaces are out of the market, although several have considerable tonnages in their yards. Inquiries today are scattered and light, and the majority of sales are being made through private solicitation. No quotations are available for southern Ohio silvery iron, as all makers have withdrawn from the market.

St. Louis Prices High

St. Louis, Feb. 26.—The pig iron industry is badly mixed, owing largely to embargoes and to difficulty in making shipments. Prices are high and very firm. There is not much inquiry in the market, the largest being 450 tons of ferro-manganese for shipment over the last half. Southern No. 2 iron is quoted at $30, Birmingham, by one furnace, and some has been sold recently as high as $28, while $26 has been declined by furnaces. Northern iron is held at $32, Chicago, and $35, Ironton, for any delivery.

Southern Iron Advances

Birmingham, Ala., Feb. 27.—Pig iron buying is halted in the south only through announcements by furnace companies that they have withdrawn from the market. Several companies have given notice that they have about as much business already booked as they can handle, and they are accepting only small tonnages for regular customers. Quotations have advanced again and are around $25 a ton for the rest of the year. Iron for first half delivery is scarce. Intimation has been given by some producers that the new price will not obtain long. Some optimistic observers are confident that predictions of $30 iron by July 1 will be realized. Many inquiries are being received here and lots ranging around 5,000 tons are being mentioned. Export business is also being offered but the railroad and steamship restrictions on this business practically exclude any more orders being accepted. A number of small consumers have been making efforts to get iron in one and two carloads at a time. Furnace company officials in this district describe the car situation as the worst ever experienced. Sales of iron in the Birmingham district during the present month will aggregate 400,000 tons. Because of the traffic congestion the accumulated stock of 200,000 tons of iron will hardly be reduced much for some time to come. The output for the month promises to show up favorably, no furnace being reported as banked, though coke supplies are still somewhat uncertain. The home melt of iron in the southern territory is still active with foundries and machine shops promising to require more material as refinery business is being offered.

Charcoal iron is in good demand at $28. Special analysis irons are bringing $1 to $1.50 premiums over standard foundry irons.

Spiegel Demand Is Growing

Difficulties in Obtaining Ferro-Manganese Cause Buyers to Seek Spiegeleisen—Prices Stiffen on Both

New York, Feb. 27. — Spiegeleisen continues to attract the attention of many buyers who are having difficulty in getting supplies of ferro-manganese or who are unwilling to pay the ruling prices for the latter. The present price of $75, furnace, for second quarter 20 per cent spiegeleisen, taking into account the bessemer iron content, it is pointed out, is equivalent to $178, furnace, for manganese units, corresponding to those of 80 per cent ferro-manganese. The price for spot and early ferro-manganese is from $275 to $300, delivered. Some consumers also are seeking spiegeleisen to fill bessemer steel orders. One inquiry in the market calls for 10,000 tons and another for 3,000 tons, both for shipment by the end of the year. The latter has been put out by a New York merchant. The American Steel Foundries has inquired for 1,000 tons. A buyer in the Chicago district during the week closed for 750 tons for shipment by July at $78, delivered. A number of other sales in 100 to 1,000-ton lots, have been closed. The free supply before July is small. Makers are quoting from $75 to $80, furnace for shipment by midyear. One large maker who has nothing to offer except for the last quarter has been quoting $60, for that position. Last half metal is held at $65, furnace.

The week has brought little change in the ferro-manganese situation. English makers have disposed of 4,000 to 5,000 tons additional for last half at $185, seaboard. Carloads and small lots of domestic metal for early shipment are bringing $275 to $300, delivered. Sellers have found few buyers, however, who will pay $300, delivered, for carloads. Third quarter delivery is quoted by domestic makers at $225 to $275 and fourth quarter at from $200 to $250. The week's sales included one lot of 1,200 tons and another of 600 tons. A large independent steelmaker is sounding the market and may purchase an important amount.

Ferro-silicon prices continue on a high plane. Several hundred tons of bessemer ferro-silicon for delivery by July were sold to an eastern consumer at $52.50, furnace. Small lots of 50 per cent ferro-silicon were sold this week at $225, delivered, but much higher has been obtained in other instances.

Ferro-Alloys Higher

Pittsburgh, Feb. 27.—As a result of the undersea activity of the U-boats, prices of 80 per cent ferro-manganese continue to advance sharply. For spot shipment, domestic material this week has been sold at $300 a ton, and as high as $270 has been paid for off-grade lots. About a week ago, a consumer in this district bought 1,000 tons of English material at $185, seaboard, for shipment in the second half of the year. Several dealers are asking $250 for future shipment. Fifty per cent ferro-silicon, offered at less than $100 a ton 90 days ago, now is commanding $235 for nearby delivery. Prices of lower grades of bessemer ferro-silicon have been advanced about $5 a ton, 10 per cent material now being held at $47, furnace, and above. An acute scarcity of fluorspar exists, material being held at as high as $30 a ton. Most consumers, however, covered requirements for the year at $7 to $7.50 a ton.

The Walker Foundry & Machine Co., New Florence, Pa., plans to put its new gray iron foundry into operation in June.

(*For complete prices see page* 552.)

Steel Bars

In Strong Demand at Chicago—Some 1918 Business Booked

Chicago, Feb. 27.—Soft steel bars are unusually strong at 3.19c, Chicago mill, with unabated demand and unusually active specification on the part of consumers. Practically nothing remains available for 1917 delivery on the part of any large producer and the leading interest is booking business for first half of 1918, although this tonnage is not large.

The situation is so strong that an advance on all finished steel products is expected within a short time.

Hard steel bars are strong at 3c, Chicago mill, and, with a larger supply of rerolled rails, mills have increased their schedule of operation and are turning out larger tonnages. The general experience is that most specifications called for sections rolled from web and flange, while heavier pieces from the rail head are not in as strong demand. However, it has been possible to keep mill operations fairly well balanced in this respect.

Bar Price Boosted

Pittsburgh, Feb. 27.—Several independent manufacturers of steel bars now are asking 3.25c for future shipment, or $5 a ton above the price adopted a short time ago by the Carnegie Steel Co. Fairly heavy demand exists for steel bars, although the market is not nearly so excited as it was a couple of months ago. Bar iron nominally is quoted at 3.25c; reports of that figure being shaded are heard in isolated instances.

Lull at Buffalo

Buffalo, Feb. 27.—A lull in the inquiry in the past week was due to the railroad situation, curtailment of production by the mills and uncertainty as to the future growing out of the international complications. Mills for the most part are sold up solid over the remainder of the year.

Few Contracts Closed

Philadelphia, Feb. 26.—Little in the way of the closing of steel bar contracts for the second quarter by miscellaneous consumers has yet developed with independent makers in this district. March is expected to bring forth considerable business of this kind. Leading independent mills have kept their price unchanged at 3.15c, Pittsburgh, an almost nominal figure in view of the limited amount of material that is being offered. It is not certain that this price will be continued by some makers, on second quarter contracts. Ship yards, both domestic and foreign, still are figuring on some good tonnages of bars. Some large inquiries for ordinary soft steel bars for export, including one of 6,000 to 8,000 tons, also are out.

Chicago Bar Iron Strong

Chicago, Feb. 27.—Spirited selling of bar iron has occurred during the past few days, and the greater portion of the second half production seems to have been contracted. The situation is strong, and while some contracts were made at 2.90c, Chicago mill, for last half delivery, it is improbable that this price covered much tonnage and nothing more is available below 3c, Chicago. In fact, most of the tonnage recently booked has been at the higher level.

Shafting Price Stiffens

Pittsburgh, Feb. 27.—Cold-rolled steel shafting manufacturers have been called upon quietly by the United States government for rather heavy tonnages of material, which is being used, it is believed, for shell fuses. People in close touch with the situation say federal authorities have been playing a much more prominent part in the steel market than generally believed. Shafting is being held at 15 per cent off the list, although the 20 per cent off the list price has not disappeared entirely.

Hoops and Bands Higher

Pittsburgh, Feb. 27.—Mills in a position to meet specifications for shipment before July 1 experience no difficulty in selling hoops at as high as 4.50c and bands at 4.35c. The Carnegie Steel Co. has no formal quotation for steel hoops; it continues to quote bands nominally at 3c for delivery at its convenience. Specifications for hoops and bands are heavy, but not much new business is reported.

Pipe Trade Active

Pittsburgh, Feb. 27.—Manufacturers of tubular goods cannot promise deliveries in less than from three to 12 months. Several manufacturers of lap welded iron and steel pipe have withdrawn from the market for delivery this year. If oil country material could be delivered promptly, it is probable that several large pipe line projects, now under consideration, would be undertaken. Premium prices are being offered for nearby delivery. Specifications for butt weld pipe are heavy, but most mills cannot promise deliveries within three to four months. Boiler tubes are being held at from $2 to $10 a ton above prevailing quotations, adopted Nov. 20, last.

(For complete prices see page 552.)

Little Tonnage

Of Billets and Sheet Bars Available for Second Quarter

Pittsburgh, Feb. 27.—Manufacturers of billets and sheet bars in this district have disposed of virtually their entire output for delivery in the second quarter of the year, at about $65, mill. Some makers have advanced prices to $70, mill, but scarcely any tonnage is available at any price. Specifications against contracts are heavy and new buying would involve considerable tonnage, if manufacturers could meet demands of consumers. The shortage of natural gas continues to curtail production, and congested traffic conditions have tended to complicate the situation further. Forging billets are being held at $90 to $100 a ton. Some makers have sold fairly heavy tonnages at those prices for delivery in the third quarter. Wire rods are commanding as high as $85, Pittsburgh. Muck bar nominally is quoted at $50, Pittsburgh.

Pass Up Business

Philadelphia, Feb. 26.—Eastern sellers of semi-finished material constantly are being obliged by their sold-up condition to pass by many attractive opportunities for new business even from their regular customers. The American Locomotive Co. inquired of regular sources of supply in the east for 1,000 tons of forging billets but could not be accommodated and was obliged to obtain this material in the west. Other large buyers who came into the market the past week have had a similar experience. Small sales of forging billets have been made by eastern makers at $85, base, mill, but it is stated that probably $90 to $100 would be named were any further sales to be made. Rerolling billets nominally are $65, mill. A southern maker who has been offering electric steel ingots at about $71, delivered, in this district has withdrawn from the market.

Few Sales in Valley

Youngstown, O., Feb. 27.—The market for sheet bars in the valley for first and second quarter is practically a closed book, and none may be bought as yet for third or fourth quarters. A little last half business has been done, but such semi-finished as was in the market at all has been withdrawn. Second quarter bars sold at a minimum of $65; it is expected that $68 to $70 may be asked for third quarter. As for the last quarter of the present year, no one is willing even to guess at what the price will be. Production at present is badly crippled by inability to get shipments of raw materials.

Platemakers Are Swamped

New Inquiries During Past Few Days Match the Enormous Demand of Preceding Week—Japan Wants 50,000 Tons

Philadelphia, Feb. 26.—Thousands upon thousands of tons of new plate business, especially for ships, continues to be declined by eastern Pennsylvania mills because of the utter inadequacy of capacity to cope with the veritable flood of demand. New inquiry the past week has kept pace with the record-breaking rush of the preceding week. Japanese ship yards came out with a new request for 50,000 tons of vessel steel; Canada asked 10,000 tons of plates to be used there; a Chester ship yard which has been in the market constantly for some weeks now is pressing for action on requirements of from 8,000 to 20,000 tons; Pacific coast builders, who are figuring on some of the additional freight boats for the Cunard line, are seeking large tonnages and their representatives have been on the ground in the east during the week working to get the best delivery propositions out of the mills. The Newport News Ship Building & Dry Dock Co. has taken another freight boat and has closed for the steel, 3,000 to 4,000 tons. Many other vessels are before domestic yards and placing them depends upon the delivery which can be obtained on the steel. The unsettled foreign inquiries for ship steel runs into very large figures. The tendency of plate prices continues upward. One eastern mill in the week quoted 6.50c, base, mill, on ship plates for early next year. Another maker declined a large tonnage at this price. A sale of 2,000 tons at above 6c, Pittsburgh, was made. Another maker sold 7,000 to 8,000 tons at 6c, Pittsburgh. Steel Corporation mills are credited with a sale of 5,000 to 10,000 tons of ship plates for the year at 4.50c, Pittsburgh. Many domestic buyers of plates are eager to make contracts but the mills are very conservative in this regard. They will accommodate only regular customers and then will cover them in strict accordance with actual requirements. Car shops and locomotive builders are calling heavily on the mills and it seems impossible to satisfy all needs, a situation to which the railroad congestion has contributed. A bridge shop has asked for 5,000 tons for coming navy yard work. The Southern railroad has a 5,000-ton car material inquiry still in the market. There is continued talk of a possible advance in tank plates to 5.50c, Pittsburgh, soon. They are held at 5c, Pittsburgh, by eastern makers at present.

Barges for Norway

New York, Feb. 27.—Norwegian shipping interests are in the market for a number of 1,000-ton steel barges for handling coal and other bulk materials. Each barge will require 500 tons or more of steel. The inquiry now before builders calls for four or more of these barges.

$200 a Ton for Plates

Philadelphia, Feb. 27.—A price of 10 cents per pound, or $200 per net ton, on ship plates does not appear as fantastic as it may seem at present, since a communication from a prospective foreign buyer was received by a leading eastern maker during the past week. This buyer made a strong request for some tonnage for delivery in 1917 and ended his inquiry with the entreaty that the mill do its utmost "to shade a price of 10 cents per pound". The producer in question has been holding ship plates at 6c. He could not have accommodated the foreign buyer, he says, even at twice 10 cents per pound, since his capacity is filled tight on ship plates for 1917. In some quarters of the eastern plate field, the opinion is held that 10-cent plates would not be surprising before the world-wide famine in ship steel has reached its crest.

Plate Demand Continues

Chicago, Feb. 27.—Consumers of steel plates are actively in the market and are seeking out every means to obtain contracts for further material for any delivery. While the nominal quotation for future mill delivery is 3.94c, Chicago mill, the open price for steel plates is 5.19c, Chicago, and premiums running as high as 6c have been paid where immediate delivery could be given.

Plates Continue Upward

Pittsburgh, Feb. 27.—A tank manufacturer in western Pennsylvania has just purchased 2,000 tons of material for nearby shipment at 4.75c. The Carnegie Steel Co. continues to quote plates at 3.75c for delivery at its convenience, but most manufacturers are asking 4c and above for future shipment. Specifications against contracts are exceedingly heavy.

Although the traffic situation has improved moderately heavy tonnages of finished steel continue to pile up in mill yards and on shipping platforms. Some concerns have fully 85,000 tons of finished material, which cannot be shipped because of the paralysis of railroad transportation.

(For complete prices see page 552.)

Navy Yard

Work May Total 10,000 to 15,000 Tons—Inquiry Lively

Philadelphia, Feb. 26. — Additional navy yard work for the government totaling perhaps 10,000 to 15,000 tons, according to informal estimate, is in prospect. One of these jobs calls for a large gun shop. Plans and proposals for this work have not been issued as yet. An 8,000-ton job reported to be in sight in this city, now is understood to be an addition to the Curtis Publishing Co. building. Many large buyers are coming to eastern mills for round tonnages of shapes. In some cases, notably one for 5,000 tons, these represent an effort to make up shortages caused by deferred deliveries on contracts from other makers. Eastern makers are going slowly in taking from the offered tonnage. Indications point more strongly to another early price advance by the former. One independent who raised his schedule to 4c, Pittsburgh, has found no hesitancy among buyers in taking this price for second quarter. A 3.25c, Pittsburgh price, which still is quoted by one eastern mill is made to apply only to regular customers and the business must be attractive. A 3.50c quotation is more general with 3.75c, named on odds and ends.

Shops Well Booked

New York, Feb. 27.—New inquiry for structural work has been less lively during the past week. Eastern shops, generally, however, are in a comfortable position on bookings and the continued difficulties in getting steel due to freight congestion, mill arrearages, etc., limit their aggressiveness. There is considerable variation in fabricated prices which seems to be explained by the fact that specifications against plain material contracts are on an appreciably lower basis than current mill quotations. Some shops are more generous than others in dividing this advantage with the buyer. Industrial plant work was placed this week under $105, per ton, delivered. New York building work still is developing slowly. Plain shapes show a

stronger tendency and the inside price of 3.25c, Pittsburgh, is limited to very desirable business while 3.50c and higher is quoted usually.

Shape Demand Heavy

Pittsburgh, Feb. 27.—Fabricators in the Pittsburgh district are operating plants at maximum capacity. None of them appears to be in a position to meet specifications for prompt delivery, although in some instances, builders and erectors have been able to have steel fabricated by furnishing their own material. Structural shapes, for future delivery, are commanding 3.25c and above.

Inquiries Brisk

Cleveland, Feb. 27.—Specifications and inquiries continue to come in freely for shapes, plates and bars, but the mills are displaying increasing reluctance to accept much business. Some consumers are endeavoring to line up their bar requirements for second half delivery, but in practically all cases the mills are guaranteeing consumers only their minimum needs. An eastern railroad is taking bids on 1,700 tons of shapes for bridge work. Bids were asked this week on from 3,000 to 3,500 tons for building 33 steam shovels for Russian interests.

Structural Demand Good

Chicago, Feb. 27.—Activity of mining interests in the west is furnishing structural tonnage to fabricators and two important projects are now being figured. Bids are to be opened March 1 at Warren, Ariz., on 4,500 tons of structural material for the United Verde Extension Mining Co. The Garfield Smelting Co. will let the contract shortly for about 2,000 tons of structurals for plants of the Utah Copper Co.

CONTRACTS AWARDED.

Bridge for Rio Grande irrigation project, New Mexico, 140 tons, to the Wisconsin Bridge & Iron Co.

St. Louis & San Francisco Railway Co., various deck plate girder bridges, 1,004 tons, to McClintic-Marshall Co.

City of Los Angeles, Cal., water tank, 700 tons, to Lacy Mfg. Co.

The Lake Milling, Smelting & Refining Co., addition to Lake No. 1 mill at Point Mills, Mich., 291 tons, to Worden-Allen Co.

Woods theater and office building at Chicago, 142 tons, to Gage Structural Steel Works.

Dormitory at Byberry farms, Philadelphia, 500 tons, to the Pittsburgh Bridge & Iron Co.

Plate mill building for W. P. Worth and associates, Claymont, Del., 1,300 tons, to L. F. Shoemaker & Co.

Bridge work for the Lackawanna railroad, 300 tons, to the Fort Pitt Bridge Works.

Building for the McIntosh & Seymour Corporation, Auburn, N. Y., 220 tons, to the Lackawanna Bridge Co.

Small bridges, Wheeling & Lake Erie railroad, 600 tons, to the American Bridge Co.

Machine shop for Union Switch & Signal Co., 1,000 tons of reinforing material, Stone & Webster Engineering Co.

CONTRACTS PENDING.

Building for the Bell Telephone Co., West Philadelphia, 500 tons, bids being taken.

Addition to the Curtis Publishing Co. building, Philadelphia, estimated at 8,000 tons, plans being prepared.

Column cores for warehouse for Strawbridge, Clothier, Philadelphia, 500 tons, bids being taken.

Three buildings at various Pennsylvania points for the Armstrong Cork Co., 1,200 tons, bids being taken.

New York state barge canal, three contracts, viaduct at Clyde, N. Y., bridges at Little Falls and Schuylersville, N. Y., taking 750 tons structural, bids received Feb. 28.

Building for the Niles-Bement-Pond Co., Plainfield, N. J., 240 tons, bids being taken.

Loft building for Eimer & Amend, East Nineteenth street, New York City, 540 tons, bids being taken.

Building for the General Electric Co., Lynn, Mass., 380 tons, bids being taken.

Overhead bridge for the Pennsylvania railroad, 250 tons, bids being taken.

Central library building, Prospect park plaza, Brooklyn, 2,000 to 3,000 tons, of which first section, 350 tons, now is up for bids.

East high school and Lincoln grade school, Erie, Pa., taking 250 tons, bids went in Feb. 27.

McKelvey department store, Youngstown, 1,400 tons.

Sheet Mills Are Hampered

Railroad Conditions Seriously Impede Movement of Both Incoming and Outgoing Shipments—Production Falls Off

Youngstown, Feb. 27.—Between a continuing heavy demand and an extreme difficulty in procuring materials of production, the Mahoning valley sheet producers are having a hard time. The railroad situation is again bad, both as to incoming and outgoing shipments. Production ranges from about 75 to 85 per cent of capacity and, unless expected relief in traffic conditions comes, it will go much lower.

The mills are running along from day to day with so little raw material, chemicals and fuel that shutdowns are always just around the corner. And when the finished material is laid down in the shipping rooms only about half of the manufacturer's troubles are over. Most of the shipping rooms in the valley are crowded with tonnages, much of which should have been moved weeks, and even months, ago. But the consumers of sheets are more patient than they were in the earlier days of the traffic troubles, and are glad to get what shipments they can. No business is taken now by the producer where delivery at a certain time is specified. Consumers who make such specification are turned down.

Prices continue to harden, and even at their high level one concern reports having sold a month's business in the week past. Practically all mills are sold up for most of their first and second quarter output, and if bars go to $70 for the last half of the year, as many predict, prices of sheets seem certain to advance.

Bessemer black sheets are quoted at from 5c to 5.50c, with one concern quoting 5.75c; blue annealed is held at from 4.25c to 4.75c, with a quotation here and there of as high as 5c; galvanized is quoted at 6.50c to 7c.

Production of coated sheets is crippled more than any other branch of the business. In the Mahoning valley hardly more than 25 to 30 per cent of capacity is being produced.

Demand Increases

Philadelphia, Feb. 26.—Blue annealed sheets are held by eastern makers at a minimum of 4.75c, Pittsburgh, or 4.909c, Philadelphia, for No. 10 gage, and little trouble is experienced in obtaining that price. The call for material from the regular sources of demand is heavier than ever. Second quarter production is sold up solidly and a good proportion of that of the third quarter also is absorbed as the larger buyers have been closing further ahead than usual.

Shipments by Express

Pittsburgh, Feb. 27.—Anxious consumers of sheets, affected by railroad embargoes, have bought rather heavy tonnages of material for shipment by express. Heavy tonnages of special grade sheets are being shipped to eastern centers by express and some material has been similarly delivered to Detroit automobile manufacturers. Specifications against contracts are exceedingly heavy. Prices are hardening but no great change in the position of quotations is expected until manufacturers open books for delivery after July 1. Black sheets are commanding from 4.75c to 5.50c, base; blue annealed, from 4.50c to 5c, and galvanized sheets, from 6.50c to 7.50c for early shipment. Not more than 39 per cent of the galvanizing capacity of sheet mills is in use.

It is interesting to note that black sheets have advanced $55 a ton, blue annealed, $65, and galvanized sheets, $75 a ton during the last couple of years. Since Dec. 1, prices of all three products have advanced about $5.

(For complete prices see page 552.)

Coke Shipments Improve

Better Supply of Cars Relieves Situation in Connellsville District Somewhat—Prices Recede Little

Pittsburgh, Feb. 27.—Reports differ as to the railroad traffic situation in the Connellsville regions. A careful investigation conducted by *The Iron Trade Review*, however, leads to the belief that the supply of hopper and rack cars in the coke fields this week has been much more satisfactory than previously. Several prominent traffic managers say enough coke is in transit to supply all of the blast furnaces in the district. Blast furnace managers say coke shipments in the last few days have been about normal. The Carnegie Steel Co., which had 13 blast furnaces banked a week ago, on account of deferred deliveries of coke, now has only one blast furnace stack idle for want of fuel.

Spot furnace coke last Saturday commanded $13.50 a ton at the ovens; today it is being sold at $12 to $13 a ton. Spot foundry coke is commanding $13 to $14, although a couple of cars were sold at $15 a ton at the ovens the latter part of last week. Rather heavy tonnages of cupola fuel have been sold for shipment after July 1 at about $7 a ton. *The Connellsville Courier*, for the week ending Feb. 17, says production was 306,624 tons, compared with 302,933 tons the week before. Rail shipments in the week ending Feb. 17 were slightly heavier than those of the preceding 7-day period.

Some Improvement in East

Philadelphia, Feb. 27. — Eastern furnaces continue to be forced to enter the market as purchasers of spot coke at extraordinary prices because of the failure of shipments to reach them. In some directions, there has been an improvement this week in the situation. The improvement has not extended to all furnaces, however. A sale of 1,000 tons of spot Connellsville furnace coke was made to an eastern consumer at $12.50, ovens, and one small sale at $13, ovens, is reported. Producers during the past few days have been quoting spot at $12.50, ovens, net, equivalent to about $13, to the consumers. A central Pennsylvania furnace company, which has been inquiring for 10,000 tons of coke monthly beginning April, has been able to secure a quotation on only 1,000 tons of this amount. A liberal buying of foundry coke for last half delivery, has been going on in this district and the week's reported sales were approximately 10,000 tons with considerable business still pending. These contracts were placed at $7.20, western Pennsylvania ovens. The Lenoir Car Works has inquired for 1,500 tons. The American Locomotive Co. has contracted for its last half needs, 9,100 tons. In New England, local by-product coke is going at $16 and higher, delivered. The Seaboard Air line has inquired for 400,000 to 500,000 tons of locomotive steam coal to cover its contract requirements for the year beginning July 1.

Coke Uncertain

Cincinnati, Feb. 26.—Coke continues uncertain. Shipments are greatly handicapped by the embargoes of different railroads to points north of the Ohio river, but dealers state that the principal difficulty is to secure railroad equipment. The cost of labor in the coal mines is expected to be very high during the coming summer and that reason, it is pointed out, indicates that no recession from present high prices is in sight. Spot foundry coke continues to sell from $12 to $15, ovens. Contract foundry coke ranges in price all the way from $7.50 to $11, ovens. No quotations are out for furnace coke.

Deliveries Slow

St. Louis, Feb. 26.—Coke shipments are hard to make because of the traffic congestion. Connellsville 72-hour foundry grades are held at $13, ovens. The inquiry is light.

Southern Coke Up

Birmingham, Ala., Feb. 27.—Spot coke in the south sells at $12 per ton if the purchaser is not a regular customer and wants immediate delivery. This price has even been exceeded. Some small consumers are pleading for a car or so at a time. The production is holding up well. The output will be increased shortly, the 37 Koppers by-product ovens of the Gulf States Steel Co. at Gadsden being finished. These ovens will probably be fired within a few weeks. This plant will render much assistance to the coke market, as the Gulf States Steel is now buying on the open market in addition to having a number of its own beehive ovens in operation. The Sloss-Sheffield Steel & Iron Co. is also buying on the open market in addition to making its own coke, and one or two other iron-making companies are doing the same. It is intimated that on the first break in the high cost of construction and of material, preparations will be started to increase the coke possibilities in this state by at least 10 to 20 per cent, by new coke-making equipment.

(For complete prices see page 552.)

Some Activity

Displayed in Market for Iron and Steel Scrap—Prices Firm

Pittsburgh, Feb. 27.—The market for old iron and steel scrap, which had been dormant since early in December, is beginning to show signs of recuperation. Heavy melting steel is being sold at as high as $24 a ton in adjacent territory, and several of the more prominent dealers have advanced prices to that figure for shipment in this district. Low phosphorus steel scrap has commanded as high as $35 a ton and cupola cast and heavy breakable cast iron scrap are being held at $2 and $3 a ton above prices prevailing a week ago. The lifting of the embargo for shipment to western points by the Pennsylvania Lines west, has tended to strengthen the situation appreciably. Restriction imposed by the railroads largely are responsible, it is believed, for the depressed condition of the market recently.

Prices Up in East

Philadelphia, Feb. 26.—Buying of old material in this territory is becoming more aggressive and as it has counteracted the recent tendency to sell, new business is larger and a general advance of 50 cents to $1 a ton has resulted. Brokers as well as consumers are in the market more freely but the former are not disposed to obligate themselves on any large amounts at present. Sales accordingly while more numerous are not heavy. A tidewater steelmaker who has been buying for several weeks has closed for further lots of heavy melting steel up to $22, delivered, at least and is offering $22.50. No sales at the latter figure are yet reported, however. The rolling mills are seeking and placing considerable tonnage. Railroad wrought has become scarce and makers have offered $27, delivered.

Little Buying at Cleveland

Cleveland, Feb. 27.—Except for a slight raising of the maximum price quoted for stove plate there is little or no change in the old iron and steel price list. Stove plate, which has been quoted at $12.25 to $12.75 a net ton, now is offered at $12.25 to $13.

Any kind of change in the price list at this time when there is not enough

trading to establish definite market figures, is mainly a reflection of trading as between dealers. Heavy melting steel remains at $22.25 to $22.75, with some trading inside this range and very little outside of it.

The transportation situation has eased up a little. The principal difficulty now seems to be in finding cars here and there that have been on the way for some weeks and even months. Of course, there still are individual difficulties that cause irritation, but the general tone as to shipments is better.

There are now three kinds of sentiment in this territory: one group of dealers clings to the belief that a buying movement at higher prices is not far off; another believes that a buying movement is not far off but that it will be at lower prices; yet another thinks that consumers may be able for some time to hold off any concerted buying movement at any price.

Inquiry Revives

Buffalo, Feb. 27.—Dealers in old materials report that the railroad situation which had practically paralyzed the business for the past two weeks is improving. As a result of this change, a number of large inquiries for heavy melting steel and for old car wheels are reported.

Chicago Scrap Strong

Chicago, Feb. 27.—Although comparatively little buying of iron and steel scrap is being done by consumers, the market has many elements of strength and brokers are holding their present stocks and accumulating more. Prices remain comparatively unchanged, although slight advances have been made in a few grades. The general expectation is that a generally higher level will prevail in a short time.

The railroad situation is improving gradually and cars in transit are being delivered with less delay than formerly. This has made it possible for mills to obtain a supply of certain grades of scrap, which they had lacked through inability to get delivery of material consigned to them.

Few railroad offers are out, only two lists now being before the trade. The Rock Island railroad offers 3,000 tons and George W. Jennings 2,200 tons.

Deliveries Delayed

Cincinnati, Feb. 26.—Inability of railroads to make satisfactory deliveries is aiding in keeping the iron and steel scrap market strong. A large number of melters, who are unable to secure sufficient shipments to meet their needs, have been forced to come into the market from time to time for spot tonnages, and are willing to pay good prices if delivery can be guaranteed. Dealers could sell a much larger tonnage if equipment could be secured from the railroads, but the latter have been furnishing only a few cars at a time. The supply is accumulating, and if the railroads can clear their tracks, a large amount of old material will be thrown upon the market. Heavy melting scrap today has advanced slightly, being quoted from $19.50 to $21, Cincinnati.

Market Unsettled

St. Louis, Feb. 26.—The scrap iron and steel market is unsettled, due to the uncertainty about freight congestion and railroad embargoes. The tendency of the market is toward slightly higher prices. Most of the big consumers have contracted for large tonnages of old material, but owing to the delay in deliveries these buyers continue in the market and are paying premiums for prompt shipments. Since the majority of consumers have been melting heavily and making inroads on their surplus stocks, dealers are looking for some active advances in the market in the near future.

The only railroad offerings before the market this week are: Chicago, Burlington & Quincy, 2,025 tons; Vandalia, 460 tons, and an open list from the New York Central, which closed Feb. 27.

Little Activity in South

Birmingham, Ala., Feb. 27.—The scrap market in the southern territory is not showing as much strength as the pig iron. Dealers in scrap, however, state their unwillingness to dispose of their stock except on a strong price basis, in view of general iron and steel market conditions. A few changes are noted this week in the scrap prices. Shop turnings are quoted at from $8 to $8.50, while tram car wheels are given at $14.50 to $15, stove plate at $11 to $12. Heavy melting steel is holding around $15 and $16. There is a considerable scrap stock reported in the south.

Offer Brazilian Ore

Philadelphia, Feb. 27.—Further offers of 80 cents per unit, at tidewater, have been made by consumers for sizeable lots of Brazilian manganese ore for delivery by July. The quantity covered by these offers is 10,000 tons. Despite some reports to the contrary, there have been no actual sales on the 80c per unit basis. Several thousand tons additional of Indian ore to leave that country during the first quarter have been sold at 75 cents per unit, tidewater. The time required to transport Indian ore is illustrated by the fact that a vessel which left that country in November, only now is discharging at eastern seaboard.

(For complete prices see page 532.)

Price Up

Southern Makers of Cast Iron Pipe Announce Advance

New York, Feb. 27.—Southern makers have put into effect another advance of $1 a ton on cast iron pipe, placing 6-inch class B at $37, and 4-inch at $40, at the foundry. Eastern makers are expected to follow suit in the very near future in view of the new advances in pig iron. Despite the expectations of higher prices soon, price shading has not been eliminated. R. D. Wood & Co. were low at $41, delivered, on 270 tons of 8's for Brooklyn, and $41.65, delivered, on 100 tons of 6's and 8's for Staten Island. Rochester will take bids March 7 on 1,060 tons of 6's to 30's. This letting is distinct from the large water line proposal, which that city soon will have in the market. Boston is out for 425 tons of 12's to close March 6. New business is not large and is fairly well distributed.

Cast Iron Pipe Advances

Chicago, Feb. 27.—Following the upward movement of pig iron, cast iron pipe has been advanced $1 per ton, bringing 4-inch pipe to $45.50, Chicago, and 6-inch and larger to $42.50, Chicago. A further advance will follow if pig iron continues to seek higher levels.

Bids will be opened March 6 at Dundee, Mich., on 450 tons, and at Chilton, Wis., on 400 tons. Figures will be taken at Castlewood, S. D., March 7, on 200 tons.

Nuts, Bolts and Rivets

Pittsburgh, Feb. 27.—It is likely that prices of nuts, bolts and rivets will be advanced at an early date. Demand for all three products is described as heavy. Ship builders are playing an active part in the market, paying premium prices frequently for ship rivets. Heavy tonnages are being sold for export.

Waddell & Son, consulting engineers, Kansas City, Mo., have opened a branch office at 165 Broadway, New York City. F. H. Frankland will be in charge. Dr. Waddell will divide his time between the two offices.

Car Orders

Fall Off Sharply in February—Foreign Inquiry

New York, Feb. 27.—A sharp falling off in car orders placed with the builders during February has reflected the higher prices now quoted for equipment as well as the extended deliveries required to fill new orders because of the restrictions of steel supply which have become intensified by the freight congestion. The February orders were the lightest in some months and amounted to less than 7,000. January showed a total of 14,000 and December 19,600. It is significant that all but a small number of the February orders were placed by the railroads with their own shops and not with the merchant builders. These shop programs called for more than 6,500 cars.

At present the market is very quiet in domestic buying as compared with the situation in recent months. New inquiry is slow. There are a number of export propositions still under negotiation, chief of which are the 20,000 to 40,000 cars for the French government. Some bids have been entered on this business but some questions of specifications still are unsettled. There is a report, as yet unconfirmed, that an additional lot of these cars has gone to a builder who has been filling various French orders.

The railroads still are buying locomotives freely. The Rock Island has out a new inquiry for 30. The Lehigh Valley recently bought 20 from the Baldwin Locomotive Works. The American Locomotive Co. recently has taken orders for one from the Aluminum Co. of America and three from the Pittsburgh & West Virginia.

February rail orders amounted to about 150,000 tons, the largest lot of which was 50,000 tons for the French government. In January, about 160,000 tons were placed. The Lackawanna Steel Co. has received 6,500 tons of contact rails from the New York Municipal railways.

Small Car Buying

Chicago, Feb. 27.—Some slight renewal of inquiry is seen in the market for freight cars although present conditions of cost and delivery keep this department at a low ebb. The Consolidated Coal Co. has ordered 300 steel hoppers from the Pullman Co. The Buffalo, Rochester & Pittsburgh railroad is inquiring for 20 way cars. The Louisville & Nashville railroad has placed an order with the Bettendorf Co. for 1,000 underframes, which will be used in its own shops in the construction of 700 box cars, 200 stock cars and 100 refrigerators. The Southern Pacific railroad has placed an order with the Ralston Steel Car Co. for 200 tank cars and 126 gondolas and will build 1,350 box, stock and freight cars in its own shops at Houston, Tex.

Advance Expected

Prices on Wire Products May Be Put Up Shortly

Pittsburgh, Feb. 27.—Prices of wire products, it is thought, will be put up at an early date by independent manufacturers. The American Steel & Wire Co. has made no change in quotations since Nov. 24, when a general advance of $3 a ton was announced. Since that date, wire products have been sold on the basis of $3 a keg for nails. Rather heavy demand exists for shipment abroad. The Russian government, which recently inquired for 100,000 tons of barbed wire, likely will buy at least 50,000 tons at an early date. England, France and Italy are negotiating for heavy tonnages in the aggregate.

Domestic demand continues heavy. Consumers of material for manufacturing purposes are attempting to cover requirements for the second half of the year, but none of the mills has opened books for delivery after July 1. Jobbers' stocks are low.

Inquiries Recede

Cleveland, Feb. 27.—Inquiries for wire have fallen off slightly, but the decline is due to the mills' inability to accept much additional business rather than to any decrease in consumers' demands. The advance in wire products which has been generally expected for some time has not developed. Most of the consumers have already placed specifications for their first half requirements and the tonnage now on mill books is serving as a bar against the acceptance of much additional business.

The Non-Ferrous Metals

Copper **Lead** **Spelter** **Tin**

New York, Feb. 27.—With unimportant exceptions, the metal markets have been dull during the week closing today. In general, copper and lead prices are unchanged but firm, spelter and aluminum have reflected a somewhat firmer tendency, antimony has been subject to fluctuations and tin prices have advanced. The sentiment underlying the metal markets continues strong, due in large part to the continued expectation that it is simply a question of time before the United States is drawn into the war.

The only development out of the ordinary in copper has been an improvement in the demand for third quarter shipment. Some third quarter business was placed yesterday and some more today and although the tonnage involved is not large, the buying is significant as reflecting the confidence of consumers. Practically the only change in copper prices has been the quoting of higher prices on future positions, and the quoting of advances on casting copper. Electrolytic copper now is quoted as follows, on the basis of cash, New York; February, 36.75c to 37c; March, 36.25c to 36.50c; April 35.50c to 36c; May, 34.50c to 35c; June, 33.50c to 34c; third quarter, 31.50c to 32c. Lake copper for prompt shipment may be quoted at 36.25c, cash, while prompt casting copper is quoted at about 34c.

Spot lead and spelter are somewhat more plentiful in the east, due to the arrival of carloads which have been in transit, in some cases for three or four months. As a result, the premiums on spot in New York are declining. Spot prime western spelter in New York, now is quoted at 11.50c to 11.75c, and spot lead at 10c to 10.25c. Lead for shipment from the west may be quoted as follows: Prompt, 9.50c, St. Louis; March, 9.37½c; April, 8.87½c to 9.12½c. Prime western spelter for shipment from the west is quoted as follows: Prompt, 10.62½c, St. Louis; March, 10.37½c; second quarter, 9.75c to 9.87½c. Brass special for prompt shipment from St. Louis is quoted at about 11.62½c.

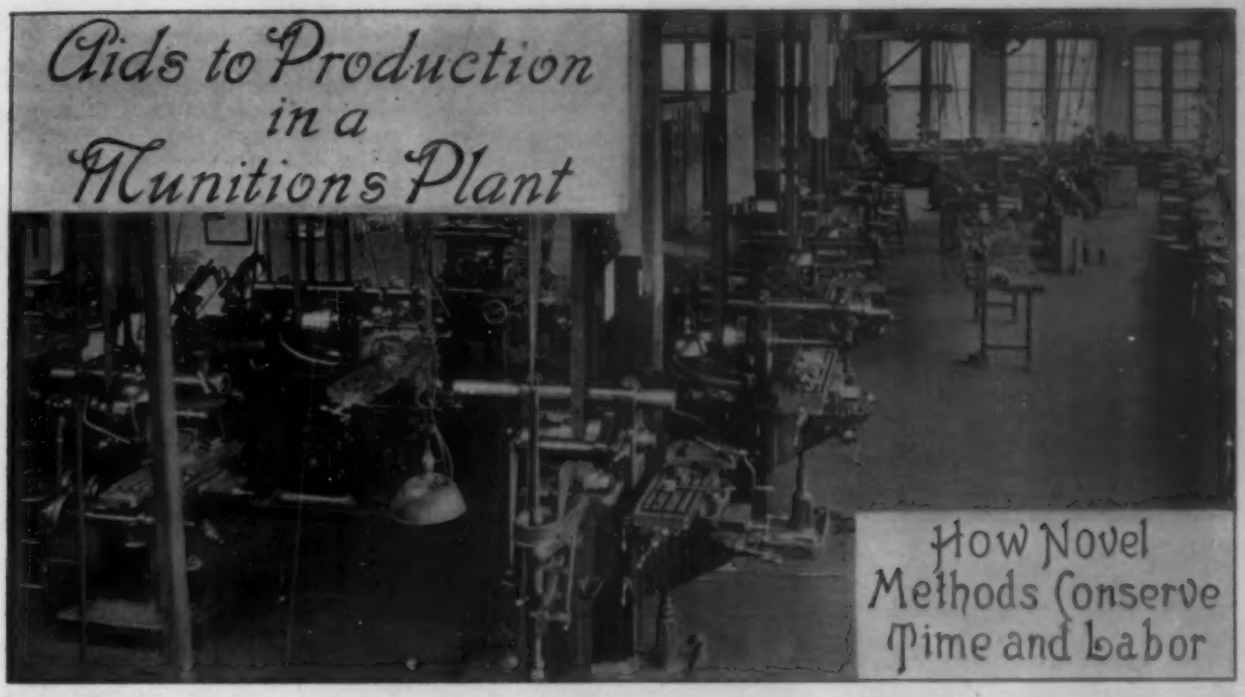
Underlying conditions in the antimony market have been exceedingly strong due to the continued scarcity of spot in this market and because offerings of futures from the Orient have been limited. Beginning last Saturday, however, there have been some offerings at lower prices than those previously prevailing, and considerable business has been done at the concessions. In one case, February-March shipment from the Orient was offered at 15c, in bond. Current quotations are: February shipment, 15.50c, in bond; March, 15c; April, 15.50c. Spot antimony has sold at 30c to 32c, duty paid, and now is quoted at that level.

The aluminum market is showing a slight upward trend. Prompt and nearby shipment may be quoted as follows: No. 1 virgin ingots, 56c to 59c; No. 1 remelted, 54c to 56c; No. 12 remelted 38c to 41c. Spot virgin material in the east commands around 59c to 61c.

The tin market has been much stronger during the past few days and prices have advanced. On Monday, good inquiries came out for the first time in several weeks but little actual business resulted. Today the market is exceedingly dull, although, following the advances at London, the market here is strong. Straits tin for spot shipment now may be quoted 51c, New York. As usual of late few limits are being offered on futures, although one interest here offers June and July Straits from the east at 46.50c, New York, a price not interesting to consumers. These latter interests are well stocked and well bought ahead and hence are not inclined to worry over market developments.

(For complete prices see page 552.)

Aids to Production in a Munitions Plant



How Novel Methods Conserve Time and Labor

MANY manufacturers are thinking that in order to make their plants efficient, they must hire a number of time study experts, adopt the latest and most approved methods of scientific management and hew to a straight and narrow line in all dealings with their employes. Without in any way depreciating the worth of modern practice which carries the idea of scientific industrial management to an extreme degree of exactness, it can be said that many managers have introduced efficiency into their shops by means of simple and unassuming devices which conserve time and labor.

The strenuous industrial activities of the past few years have emphasized more than ever before the importance of extending the productive effort of each workman to the utmost. It is realized that this cannot be done if a skilled mechanic is obliged to spend time on duties an unskilled man could perform or if an employe is idle part of the time on account of breakdowns, lack of materials, lack of help, or other disturbing factors.

For these reasons industrial managers have devoted their efforts to planning the arrangement of equipment and the details of operation so that conditions which tend to hold back production cannot exist. Their methods are preventive and corrective. They try first to lessen the chance of interruptions to continuous operation, and then to provide means of quickly correcting conditions when an emergency arises which actually throttles production.

Although the scientific planning of industrial plants is a comparatively new profession in this country, it is gaining favor with increasing rapidity. Few people, if any, would return to the old

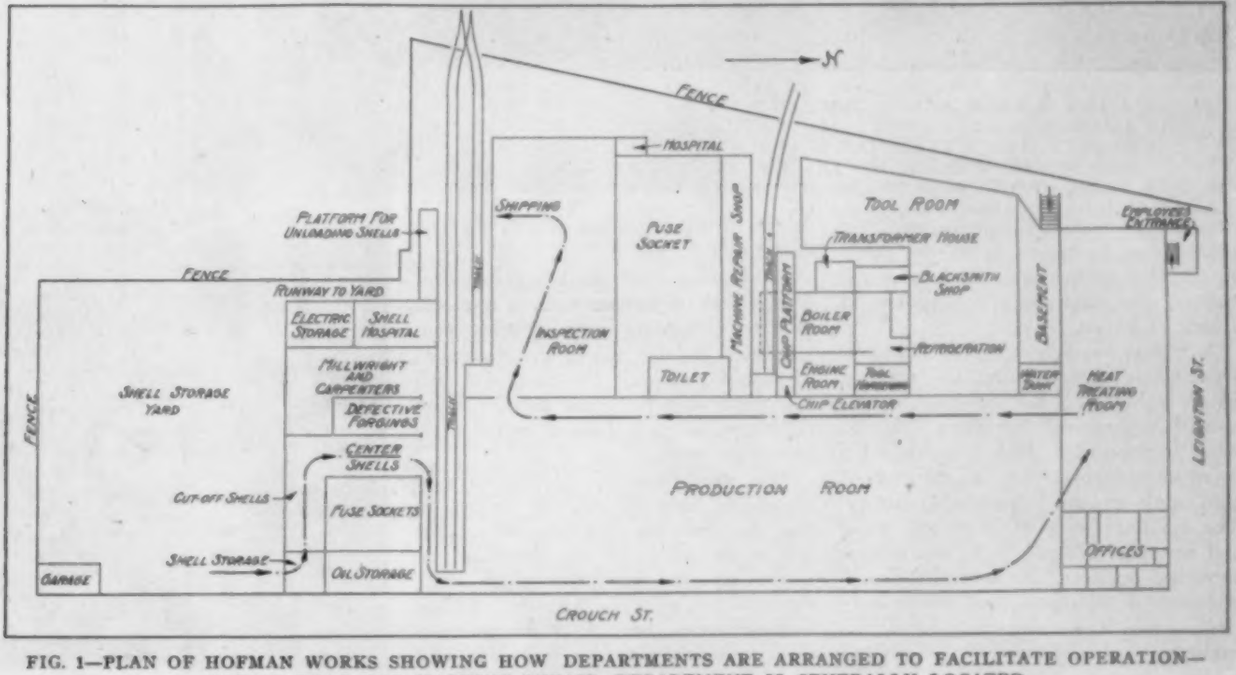


FIG. 1—PLAN OF HOFMAN WORKS SHOWING HOW DEPARTMENTS ARE ARRANGED TO FACILITATE OPERATION—NOTICE THAT THE MACHINE REPAIR DEPARTMENT IS CENTRALLY LOCATED

FIGS. 2, 3 AND 4—WHEN A LINE SHAFT IS DISABLED BY MOTOR TROUBLE, THE EMERGENCY UNIT SHOWN AT THE TOP OF THE PAGE IS PUT INTO PLAY—THE ELECTRICIAN IS CALLED TO REMEDY TRIVIAL ELECTRICAL MISHAPS BY AN ELECTRIC SIGNAL SYSTEM; ONE OF THE PUSH BUTTONS IS SHOWN AT THE RIGHT

practice of erecting a building and then placing the machinery to fit the structure. The modern idea is to plan the buildings to meet every requirement of future operation.

A typical example of good industrial planning is furnished by the problem which confronted the Symington Machine Corporation, Rochester, N. Y., when in September, 1915, it purchased a wood-working plant for the purpose of converting it into a munitions factory. The buildings were of brick and wood and were not adapted to a large manufacturing business. Extensive improvements and additions that were hurriedly rushed to completion after the engineers had determined the general scheme of operation resulted in the layout shown in Fig. 1.

In checking over the arrangement of the various departments it is apparent that the engineers gave primary consideration to the economical movement of material through the plant and that they recognized the importance of maintaining a centrally located machine repair department.

The movement of shells may be traced by the aid of the arrows in Fig. 1, from the storage yard at the left to the cutting-off and centering machines, into the production room where the machine work is done, to the heat treating room, back to the production room and finally to the inspection and shipping departments. A wise compromise has been made between the desirability of moving the work through the shop in a straight-forward manner and the physical limitations of the remodeled buildings.

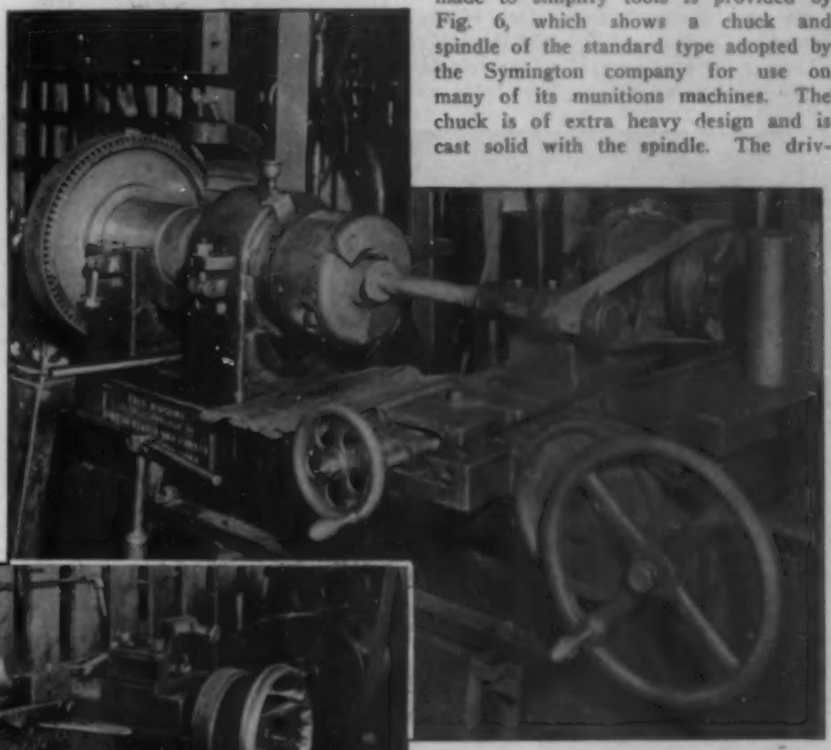
The plant layout, however, is especially interesting because of the provision that has been made to aid production by reducing the time loss due to breakdowns. In referring to Fig. 1, it is noticeable that the repair shop is situated in the

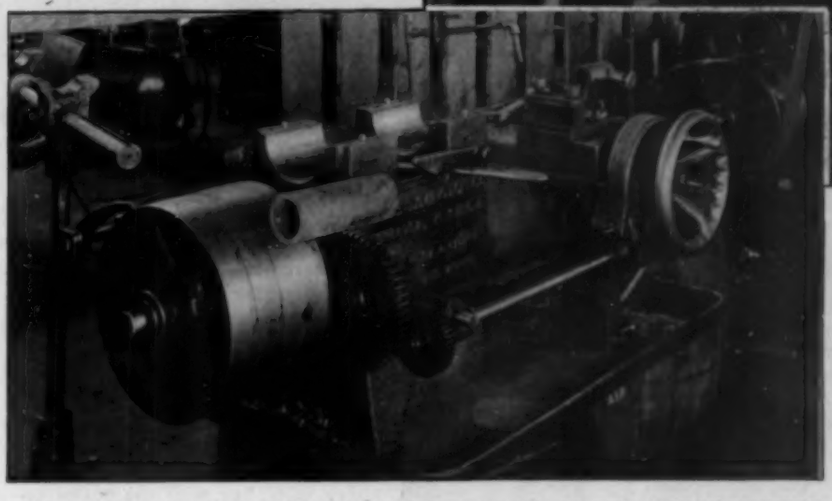
very center of the elaborate mass of machine equipment. It is adjacent to the tool room on the north; to the production room on the east; and the fuse socket room on the south. The cutting-off and centering machines, which are not required to do accurate work are farthest away from the repair shop, as they are less liable to breakdown than almost any other type of machine.

The importance of centrally locating this repair department is more readily appreciated when the general scheme of machine maintenance is known. It is the policy of the company to concentrate all heavy machine repair work in the repair department. When a special-duty lathe or other unit goes out of commission a man from the repair shop immediately inspects it. Unless the machine requires only trivial adjustment, it is at once removed from its place in the production room and hurried to the repair shop. If it is necessary to keep the production in this particular department up to a certain standard, a serviceable machine is set up to replace the disabled one.

The transfer and substitution of machines is accomplished with less trouble than would be expected. With very few exceptions, the machines are driven by belt from line shafts, countershafts being entirely eliminated. This arrangement was made possible by standardizing the machines of a certain bay and working out sets of pulleys to meet the requirements. Split wooden pulleys are used exclusively, and the fact that they may be easily applied to any shaft has been a factor in the elasticity of the machine layout.

Precautionary measures against the possibility of machine tool failure go even farther back than the planning of the shop. The design of the machines themselves has depended to some extent upon a consideration for long life and elimination of frequent troubles. It was realized at the outset that the tremendous service demanded of munitions-making machines, working practically 23 hours out of every 24, would impose unfavorable conditions on ordinary lathes or automatics. Moreover, scarcity of skilled mechanics threatened to force shell makers to resort to the employment of untrained labor for machine tool operators. Hence it was unusually important that the lathes, boring mills and special tools be designed for extra heavy duty and be made proof against the mistakes of careless workmen. An example of the extent to which designs were changed to meet these conditions is given in Figs. 5, 6 and 7, which illustrate parts of a machine tool designed for rough-turning the outside surface of a shell forging.





FIGS. 5 AND 6—WHEN CHUCK JAWS REQUIRE DRESSING, THE CHUCK, SPINDLE AND DRIVING GEAR IS REMOVED AS ONE UNIT AND PLACED IN THE MACHINE SHOWN AT THE RIGHT—NOTE THE AMPLE DIMENSIONS OF THE BEARINGS IN THESE MACHINES

The unusual size of the spindle bearings, shown in Fig. 5 is particularly striking. The ample proportions of these details are an important factor in reducing chatter when heavy cuts are taken, and simplify lubrication and alignment troubles often experienced when these parts are designed under size.

A further indication of the efforts made to simplify tools is provided by Fig. 6, which shows a chuck and spindle of the standard type adopted by the Symington company for use on many of its munitions machines. The chuck is of extra heavy design and is cast solid with the spindle. The driving gear is keyed to the end of the spindle. Three removable jaws are dovetailed in the chuck, which is of unusually simple design. As shown in the illustration, two of the jaws are fitted into the solid portion of the chuck, while the third is fastened to a pivoted section. The pivoted part of the chuck is opened and closed by means of a heavy adjusting bolt operated by a removable chuck wrench. The heavy design, and simple construction of this chuck make it almost fool proof.

Practically the only attention required by the chucks is an occasional truing of the jaws. When the chuck jaws become worn beyond a specified limit, the bearing caps of the machine are removed, and the spindle, chuck and driving gear are removed as one piece to the repair shop. A repaired unit of the same standard is placed in the machine, so that the work in the department is not interrupted for more than the period of time required to substitute the trued chuck and spindle for the worn one. This interchangeability of spindles enables the repair department to grind the chuck jaws at its convenience, it being only necessary to

keep a certain supply of repaired chucks on hand for emergency.

The grinding of the jaws is accomplished in a machine similar to that shown in Fig. 6. The machine is essentially an ordinary single purpose lathe. The bearings are of the standard type, but the bearing caps are hinged at the back and contain slots in front so that an eye bolt may be swung into place and the nut tightened down into the cap in a moment's time. One of the caps is shown in place while the other has not yet been lowered to the spindle. The carriage of the machine holds an arbor and small grinding wheel which are driven by a belt from a small electric motor mounted at the back. In grinding the jaws, the spindle and chuck are driven by the pinion of the machine, and while the jaws revolve, the revolving grinding wheel, driven by the motor, is brought against them by means of the carriage and cross feed controls. Since the bearings of this machine are standard, any spindle and chuck may be placed on the machine without any adjustments whatever. This simple device has been an important factor in reducing lost time in the Symington plant.

Despite the remarkable efficiency of electrical power and the adaptability of electric control to manufacturing problems, there is always a chance for failure, and in a plant the size of the one under discussion, a breakdown may seriously affect production. The line shafts in the production room and in the other machine tool departments are driven by motors suspended from the roof trusses. Only a few of the larger machines are individually driven. On account of the constant regrouping of machines in a shell plant it is not uncommon to find that a motor in one bay is temporarily overloaded while tools are being transferred from one group to another. Moreover, in spite of the systematic inspection of motors at regular intervals, one of these units occasionally fails in service, and must be renewed. When it is considered that the motor equipment of this plant runs continuously for about eight hours at a time and that during a period of 24 hours, the power is off for only 30 minutes, it will be realized that an occasional breakdown must be expected.

FIGS. 7, 8 AND 9—SCRAP IS COLLECTED FROM MACHINES, PUT THROUGH AN OIL SEPARATOR, ELEVATED TO HOPPER PLATFORM, AND DELIVERED THROUGH CHUTES TO A RAILROAD CAR

Fig. 2 shows an emergency unit that is used to drive line shafts when the regular motor fails. As shown in the illustration, the apparatus consists of a four-wheeled truck, a 20-horsepower motor, switch, controller, armored cable, and a length of heavy leather belting. When a motor fails or becomes overloaded, this emergency equipment is rushed to the disabled bay; the truck is placed so that the motor pulley is in line with the pulley on the line shaft; the belt is thrown over the pulley and joined by means of a link pin and the truck is firmly anchored to the floor by means of six heavy wood screws. The armored cable is then plugged in on the power line, and the outfit is ready for use. The time required to transfer the load from the regular motor to the emergency unit is about 15 minutes. The value of the apparatus is indicated by the record established during the year ending Dec. 1, 1916, when only 52 minutes of operating time was lost in the plant on account of motor breakdowns or electrical failures.

Lesser electrical troubles often necessitate the calling of an electrician and

in many shops this is a problem that is not solved satisfactorily. Experience in the Symington plant has showed that small push buttons, conveniently placed around the shop, which operate an indicator and gong in the electrician's shop, save considerable time. Adjustment of lighting apparatus, replacement of blown fuses and broken incandescent lamps, and small wiring work is greatly facilitated by means of this signaling apparatus. A call station is shown in Fig. 4.

Concentrating on Production

One of the policies of modern efficiency experts has been that the energies of trained operators should be concentrated upon productive work, and that their attention should not be given to routine duties which can be performed by men of less intelligence. In accordance with this principle, machine operators in the Rochester plant are not required to devote attention to filling the oil cups of their machines, caring for the turnings and cuttings, looking after belts, or movement of the work to and from their machines. Their undivided attention is therefore devoted to the operation of their machines.

This practice involves the organization of a number of gangs of laborers whose duties are clearly defined. One group confines its attention to the distribution of oil to the cups on the various machines; another's duties consist of maintaining the belts in first class condition; a third division of men is engaged in moving trucks of partly finished shell forgings from machine to machine; and another gang collects chips and turnings from the machines.

An interesting method of handling scrap has been developed. The waste material consists principally of turnings and borings machined from the rough forgings. As the rough material is forged to the approximate shape of the shells, the scrap resulting from the manufacture of 15,000 shrapnel a day amounts to only a carload. This does not warrant the employment of special chip conveying apparatus used in many munitions plants where billets are drilled and bored to size.

The turnings are collected at the machines in metal trucks and are moved to oil separators situated near the center of the west bay of the production room. The cleaned oil is returned to the oil storage and the chips are dumped from the separator by means of a small hoist into wheelbarrows. Laborers push the wheelbarrows into an elevator adjacent to the separators and they are lifted to a platform which opens upon six hoppers situated above a railroad siding. The chips are dumped into the hoppers and are delivered to an open-top car below. The chip elevator and hopper arrangement are shown in Figs. 8 and 9.

Simple home-made devices which add to the convenience of the machine operators effect savings in a munitions plant. In the case of single-purpose lathes which rough turn the shell forgings, the operator is required to stamp a heat treatment symbol on the piece after it has been turned. The tool carriage consumes about one minute in traversing the length of the forging, while the substitution of an unturned shell for a turned one on the centers requires but a few seconds.

It was found that in a large battery of these machines, production was appreciably increased by systematizing every move in the operation, and by providing a place for every tool used by an operator. Therefore a simple hook was placed on each head stock to hold a forging; a safety, catch to hold the belt on the loose pulley was applied and a *V* block mounted on a solid standard was provided at the right of each machine. With the aid of these simple conveniences shown in Fig. 7, the workmen soon learned to make every movement count. This plan has proved so successful that one man can easily operate two machines, setting up the work in one and stamping a finished shell while the cut is being taken on the other machine. The original plans provided for two men for every three machines.

Well stocked storerooms are necessities in a plant where continuous operation is imperative. In the Hofman works, a large stock of supplies, including oil, grinding compound, grinding wheels, pulleys, belting, electric lamps, fuses, etc., is maintained to guard against a shutdown on account of lack of these materials. Fig. 10 is a view in the stockroom where oil and grinding wheels are kept.

FIG. 10—A VIEW IN THE OIL AND GRINDING WHEEL STORAGE ROOM, WHERE A SUPPLY OF 500 WHEELS IS MAINTAINED

Low Phosphorus Iron Ores

The Virginia-Tennessee Iron Corporation several months ago undertook an investigation of the magnetic iron ores of Carter county, Tennessee. As a result, the corporation has secured 24 properties which contain what is believed to be a high grade of low-phosphorus iron ore. The tract acquired embraces from 3,500 to 4,000 acres. The development carried on to date has outlined a large tonnage of ore averaging, it is said, over 50 per cent metallic iron and running quite low in phosphorus and sulphur.

The deposits consist of magnetites, associated with such igneous rocks as granites and gneisses, and they are in the form of continuous veins dipping southeast at an angle of 30 degrees. The general strike of the veins is northeast by southwest. A few representative samples collected from the several openings already made on the property show low phosphorus and sulphur contents on analysis, as follows: Iron, 48.88, 57.76, 49.43, 59.21, 54.91, 46.31 per cent; manganese, 1.52, 1.96, 0.03, 0.03, 0.03, 0.06 per cent; silica, 12.82, 14.48, 18.57, 9.41, 14.92, 18.60 per cent; phosphorus, 0.007, 0.040, 0.023, 0.014, 0.010, 0.013 per cent; and sulphur, 0.07, 0.06, 0.06, 0.05, 0.01,

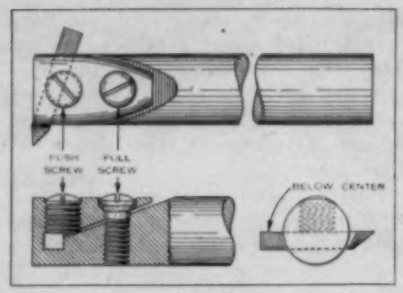
and 0.00 per cent respectively.

These samples are of the crude ore without magnetic concentration or other beneficiation. It has been found that most of the phosphorus in the crude ores is present in the gangue, and that magnetic separation not only raises the iron content 6 or 8 per cent, but also lowers the phosphorus and silica accordingly. It is reported that the ore is free from copper and averages 10 per cent higher in metallic iron than the average of the Cranberry deposits.

The work of opening the mines and building the permanent camp site will proceed as soon as the weather permits. A standard gage railroad is now being built to the camp site where the concentrating plant will be located. The furnace will be located in northeastern Tennessee, on the Southern railway. The corporation announces that it will produce 150 tons per day, or about 4,500 tons per month, of extra low-phosphorus pig iron, free from copper. John B. Guernsey & Co., Roanoke, Va., are consulting engineers for the Virginia-Tennessee Iron Corporation.

Riveter for Work in Close Quarters

A riveting machine designed for operation on work where space is limited has been developed by the Hanna Engineering Works, Chicago. The lower stake or nose of the machine is removable and can be shaped to form any base that is adapted to the work to be handled. A combination of toggles, levers and guide links are employed to give a toggle joint movement with a gradual increase in the amount of pressure applied until the desired amount is secured. This action is followed by a simple lever movement through a considerable space under the maximum pressure of the machine. The toggle action takes place while the piston is traveling through the first half of its stroke, the die covering the greater portion of its travel in that period. The die completes its stroke while the piston is traveling through the remaining half of the cylinder. The change in action from that of a toggle to that of a lever is designed to be accomplished automatically without a noticeable break between the two. As the rated maximum pressure is exerted through a relatively large space it is evident that adjustments to take care of ordinary variations in rivet length, diameter of hole or thickness of plate are not necessary after the machine has been once set. This slow movement, it is explained, also gives metal in the rivet time to flow and fill the hole in addition to giving the rivet an opportunity to set prior to the release of the pressure on the return stroke of the die. The riveter is shown in the accompanying illustration.



LEVER-CLAMP BORING BAR

Lever-Clamp Boring Bar

A new type of lever-clamp boring bar was recently placed on the market by the Rigid Tool Holder Co., Washington, D. C., formerly of Baltimore, Md. The tool holder is made of high carbon steel. Two screws are used to clamp the cutting tool. As indicated in the accompanying illustration, the pull screw brings the upper and lower sections of the bar together, while the push screw grips the cutter. No special wrenches are required and the design enables the entire cutter to rest below the center of the bar.

The William Tod Co., Youngstown, O., is completing two twin tandem compound reversing engines for the Bethlehem Steel Co. These engines are designed to develop between 25,000 and 30,000 horsepower each and are thought to be the largest reversing engines that have been built in the United States or possibly in the world. The high pressure cylinders are 46 inches in diameter, and the low pressure cylinders are 76 inches in diameter. The stroke is 72 inches.

RIVETER FOR USE ON WORK WHERE SPACE IS LIMITED

Brass Cleaner and Deoxidizer

A new deoxidizer and cleaner for brass castings has been developed by E. D. Frohman, of the S. Obermayer Co., Pittsburgh. The purpose of this purifier is to reduce the oxides which form in the ladle or crucible when melting non-ferrous metals. The purifier contains phosphorus which combines with the oxides in the metal and reduces them. The phosphorus oxides formed by the reaction come up to the surface in the form of gas or skimmings. Also, it is stated that a small portion of the phosphorus combines with the copper in the mixture. The purifier does not act as a flux but simply as a reducing agent.

When melting with flame-type furnaces, the purifier should be placed in the bottom of the ladle before pouring in the proportions of one pound of cleaner to every 500 pounds of molten metal. The reducing agent or purifier also may be mixed with the brass turnings and scrap before charging in the furnace or crucible. For this purpose two pounds of purifier to 500 pounds of metal are required. Where ingot metal is used the manufacturer recommends the addition of one pound of cleaner to 500 pounds of metal in the furnace after the metals have melted. If the metal is melted in crucibles, one-half of this amount of reducing agent should be enough.

The manufacturer states that the use of this reducing agent will decrease the oxides in the skimmings from an average of 20 per cent to 0.5 per cent. Metal which is free from oxides does not tend to stick to the lining of the ladle or crucible. This metal is particularly desirable for castings which must undergo hydraulic tests.

Returns made to Canadian department of mines for the first 11 months of 1916, with estimates for December, show the pig iron production to have been 1,171,727 short tons as compared with 913,775 short tons in 1915. The production for 1916 exceeded that of any previous year. The output of steel ingots was 1,423,485 and the direct steel castings 30,639 short tons.

Cleaning the Blast Furnace Gas

Engineers Have Expressed Widely Varied Opinions in Regard to Comparisons of the Hot-Dry Method of Cleaning Blast Furnace Gas With the Cold-Wet Method —Electrical Precipitation May Settle the Controversy

BY LINN BRADLEY, H. D. EGBERT, AND W. W. STRONG

MARKED differences in opinion have been expressed by engineers interested in cleaning iron blast furnace gases for use in hot-blast stoves and under boilers, in reference to the advantages of a hot-dry method compared with a cold-wet method. One point at issue involves the sensible heat energy in the moisture contained in the gas. Some advocates of the cold-wet methods claim that the condensation and resultant removal of the greater portion of this contained moisture by wet scrubbing, spraying or similar method, results in a saving of some of this sensible heat energy, because water vapor has a high capacity for sensible heat energy and may carry from the exit of a hot-blast stove, for example, more heat units than are sacrificed or lost when the gas is cleaned by this cold-wet method. other advantages claimed for the latter method are: That gas burns more readily when it is free from moisture in any form; that because gas is made denser by cooling and removing the moisture it has a higher colorific value than hot gas carrying moisture; and that higher flame temperatures are obtained when the gas is cleaned by the cold-wet method.

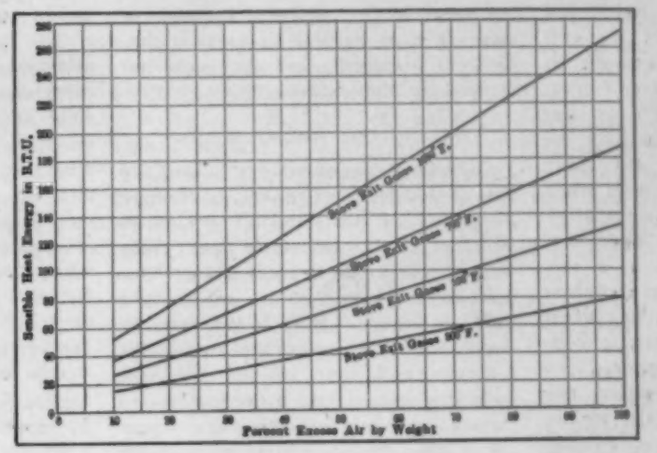


FIG. 1—EFFECT OF EXCESS AIR ON AMOUNT OF SENSIBLE HEAT ENERGY ABOVE 0 DEGREES FAHR. CARRIED AWAY WITH STOVE EXIT GASES

The total heat energy in a gas includes the heat which may be developed by combustion (chemical energy), the heat due to the temperature of the gas (sensible heat), and the latent heat vaporization. The first type of energy may be called "the heat energy of combustion" and the second type "the sensible heat energy" of the gas. The heat energy of combustion is a function of the composition of the gases. For a definite composition of gases it is practically constant and can be readily calculated. The sensible heat energy of a gas depends upon the quantity of gas, the volume and temperature of the gas and the mean specific heat of the gas. The specific heat of a gas in turn depends upon the temperature of the gas and its chemical composition.

In this present discussion 1 pound of a typical dry, clean top blast furnace gas is taken as the unit. It is assumed to have the following percentage composition by weight: CO_2, 21.00; CO, 24.00; H_2, 0.25; CH_4, 0.25; N_2, 54.50.

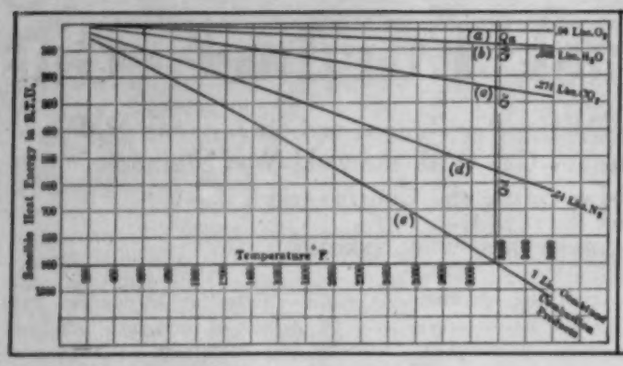
The presence of moisture, dust and excess air is measured in terms of the quantity of this foreign material per pound of such dry, clean top gas. The sensible heat energy of moist, top gas is, therefore, according to our method of calculation, the sensible heat energy of 1 pound of dry top gas plus the heat energy of the moisture which accompanies and is in addition to 1 pound of the gases which constitute the dry top gas; that is, the heat energies are added together.

In practice, the amount of moisture or dust in a gas is frequently measured in grains per cubic foot of gas. This method of measuring the moisture or dust content of a gas usually assumes that the moisture or dust is computed at a certain temperature of the gas such as 32 degrees Fahr. Thus take 1 pound of dry top gas with 20 grains of dust per cubic foot of gas calculated at 32 degrees Fahr. and 50 grains of moisture per cubic foot of gas calculated at 32 degrees Fahr. The unit of gas would contain 0.034994 pound of dust and 0.087485 pound of moisture. The unit of gas considered would consist of a total of 1.122479 pounds of matter, and a calculation of the sensible heat energy of 1 pound of dry, clean, top gas with the above moisture and dust content would involve the calculation of the sensible heat energy of 1.122479 pounds of matter. This article, however, compares two methods of cleaning, the dry-hot and the cold-wet methods. Since both methods presuppose the removal of dust, it is not necessary to consider the sensible heat energy of the dust. In the example just cited the sensible heat energy would be calculated for 1.0487485 pounds of matter, the dust being excluded.

In the example given in the preceding paragraph the amount of dust and moisture per actual cubic foot of gas decreases with rise in temperature, because the gas expands. At atmospheric pressure 1 cubic foot of gas at 32 degrees Fahr. will become 2 cubic feet at 523 degrees Fahr., and in the example of moist, dusty gas, the dust content of 20 grains per cubic foot of gas calculated at 32 degrees Fahr. will fall to 10 grains per actual cubic foot of gas at 523 degrees Fahr., while the moisture content will fall from 50 grains per cubic foot, calculated at 32 degrees Fahr., to 25 grains per actual cubic foot at 523 degrees Fahr., though the percentage of dust and moisture per pound of dry, clean, top gas has remained the same. The measurement of the density of dust and moisture in a gas is, therefore, made by calculating how many grains of each a cubic foot of gas would contain if reduced in temperature to 320 degrees Fahr., the pressure being standard at 760 millimeters of mercury.

For purposes of combustion it is necessary to add a certain minimum weight of air per pound of the clean,

A paper presented at the recent meeting of the American Institute of Mining Engineers, New York, Feb. 19 to 22. The authors of this paper, Linn Bradley, H. D. Egbert and W. W. Strong, are chief engineer, engineer in charge of commercial department, and physicist at the Research Corporation, New York, respectively.


Sensible Heat Energy in B.T.U.
Temperature° F.
(a)
(b)
(c)
(d)
(e)
Qt
Qe
Qe
Qe

constant pressure and represents the ratio of the amount of the heat energy required to raise the temperature of a unit mass of the gas one degree compared with that required to raise the temperature of the same mass of water one degree (from the temperature of maximum density).

Cm is the mean value of Cp between the temperature t_2 and t_1.

The equations used for calculating the sensible heat energy of various gases are obtained from the following equations where t is the temperature Fahrenheit.

MEAN SPECIFIC HEATS OF GASES UNDER CONSTANT PRESSURE

(To 2,000 deg. Cent. or 3,600 deg. Fahr.)

	Cm. (0 to t) for 1 lb. in B. T. U.
N_2	$0.2411 + 0.0000099t$
O_2	$0.2111 + 0.0000087t$
H_2O	$0.4701 - 0.0000118t + 0.0000000127t^2$
Air	$0.2342 + 0.0000096t$
CO	$0.2413 + 0.0000099t$
H_2	$3.3381 + 0.000124t$
CO_2	$0.1975 + 0.0000388t - 0.0000000043t^2$
CH_4	$0.5904 + 0.0000411t$

The term "flame temperature" in this paper will refer to the temperature that a gas will attain when one assumes that the energy of combustion is added to the sensible heat energy of the gas; all the resultant heat energy being used to raise the temperature of the gas, calculated on the basis of the values of the mean specific heat as given by the above equations. The actual flame temperature will be lower because some of this heat energy is conducted or radiated away before complete combustion takes place. The pressure of the gases is considered to be constant and standard. Slight changes in pressure would make only very small differences in the calculations and conclusions.

The mean specific heat at constant pressure increases for all gases, so far as known, as the temperature is increased. In some instances, values of the specific heats at constant pressure are assumed for temperatures as high as 3,600 degrees Fahr. In general, the sensible heat energy lost in cooling an iron blast furnace gas by a cold-wet method of cleaning is much greater than that carried out with products of combustion by the moisture left in the gases in a hot-dry method of cleaning. Consider the curves in Fig. 4. In E and E' the typical blast furnace top gas has a moisture content of 100 grains. From curve E it will be seen that if the top gas enters the wet cleaner at 300 degrees Fahr., it will lose 7 B. T. U. per pound of typical top gas when cooled to 60 degrees Fahr. From curve E' it will be seen that if the same gas is burned without reduction of moisture content and the product of combustion leaves the stove at 1,000 degrees Fahr., the accompanying moisture will carry away 74 B. T. U. per pound of typical top gas. Even under these very exceptional conditions, a hot-dry method of cleaning would result in a saving of 4 B. T. U. per pound of typical top gas.

Consider the other extreme condition. Assume the blast furnace gas to enter a hot-blast stove at 900 degrees Fahr. From curve E it will be seen that on cold-wet clearing 284 B. T. U. would be lost per pound of typical top gas. Also assume that the gas leaves the stove at 1,000 degrees Fahr. Then from curve E' it will be seen that the moisture accompanying 1 pound of typical top gas will carry away from the stove 74 B. T. U. In this case there will be a saving of 210 B. T. U. per pound of typical top gas. The other curves show results more favorable to the hot-dry method of cleaning, since the moisture contents are less. In practice the average moisture content seldom exceeds 35 grains per standard cubic foot of typical top gas, even when the stock in the furnace has been watered to reduce dust losses.

The effect of moisture on flame temperatures is indicated by the curves in Fig. 5. The effect of increasing the moisture content from 10 grains to 100 grains would be to lower the flame temperature produced by burning the typical gas from 2,320 degrees Fahr., to 2,090 degrees Fahr., for the gas entering the burner at 300 degrees Fahr., and from 2,440 degrees Fahr. to 2,230 degrees Fahr., for the gas entering the burner at 600 degrees Fahr. Now suppose that these gases had been cooled to 60 degrees Fahr. and the moisture thus reduced to 5 grains. The flame temperature would then have been about 2,250 degrees Fahr. In other words, a cold-wet method of cleaning would have resulted in slightly higher flame temperatures in the above cases provided the moisture content was 100 grains or greater. For a 50-grain moisture content the cold-wet method would give a higher flame temperature if the top gases were originally at 300 degrees Fahr., whereas if they were at 450 degrees Fahr., or 600 degrees Fahr. or over, the hot-dry method of cleaning would give the higher flame temperature. From the point of view of flame temperatures, there are certain temperature and moisture-content limits, on one side of which a hot-dry method of cleaning gives the higher flame temperature, while on the other side the cold-wet method of cleaning gives the higher flame temperatures. Operating conditions quite usually lie in the hot-dry region, as can be seen by a study of the curves.

The effect of excess air in increasing the amount of sensible heat energy carried out from the stoves and boilers by the exit gases at different temperatures is shown in the curves

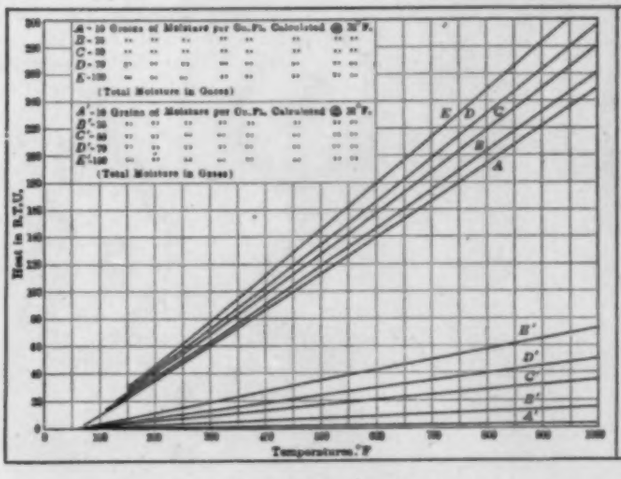


FIG. 4—SENSIBLE HEAT CARRIED OUT BY MOISTURE IN STOVE EXIT GASES

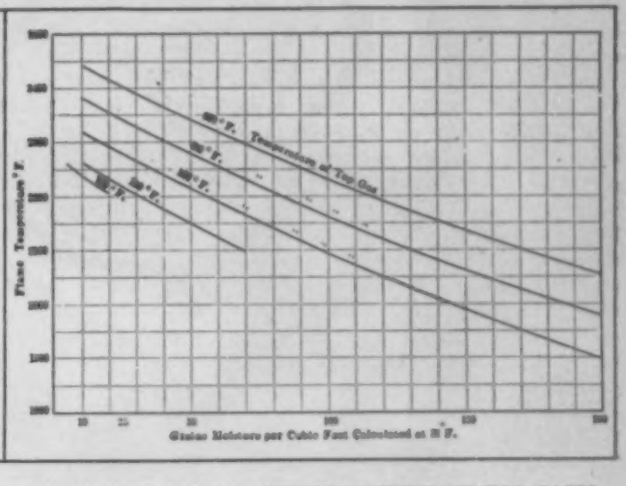


FIG. 5—EFFECT OF MOISTURE IN FURNACE TOP GASES ON FLAME TEMPERATURE

of Fig. 1. These curves assume a moisture content for the top gas of 35 grains (which is probably a fair average). The relative loss of heat energy due to excess air increases as the temperature of the exit gases is increased. The curves show how very important it is to keep the excess air down to a minimum. Thorough mixing of air and gas, and having the mixed gases hot on entering the stoves and boilers, are important essentials. Some automatic device for regulating the air input for variations (due to furnace changes) in the quantity and composition of the blast furnace top gases should be used.

The sensible heat energy in the constituents of the stove exit gases resulting from the burning of 1 pound of dry top gas, carrying 35 grains of moisture with 60 per cent excess air, the air carrying 5 grains of moisture, is given in the curves of Fig. 2 for various temperatures of the exit gases.

Although not plotted in that way, these curves could be made to show the sensible heat energy carried from the stoves and boilers by the moisture present in the original top gas and by the excess air. Such curves would give at various temperatures the loss of heat energy due to moisture and to excess air.

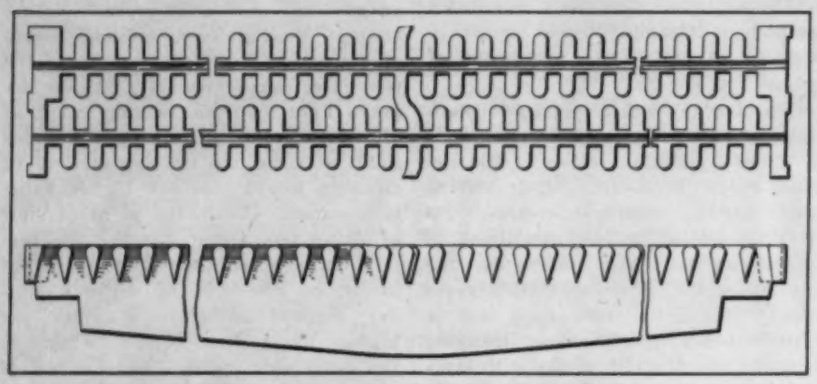
The curves of Fig. 3 show the effect of excess air on flame temperatures. A range of excess air from 20 to 60 per cent, lowers the flame temperature more than 300 degrees Fahr. As the amount of excess air is increased, the flame temperature depends less and less upon the temperature of the blast furnace top gas. The great importance of reducing the amount of excess air, both as regards the conservation of sensible heat energy and the maintenance of a high flame temperature, is shown very positively by these curves.

In some ores a considerable amount of compounds of potash, zinc, lead, arsenic, antimony, etc., may accompany the compounds of iron, copper, etc., for which the ore is being smelted. Under present conditions this more volatile part of the ore may be carried away in the top gas. A dry method of cleaning may allow the recovery of certain of these volatile compounds, thus making commercially possible the treatment of a greater variety of ores. At the present time the application of the electrical method of cleaning blast furnace gas from iron ore containing zinc is being developed and other problems similar to this are also under consideration.

Under practical operating conditions, many other conditions relating to the cleaning process must be considered. A few of these may be briefly discussed. The cold-wet process of cleaning is usually more or less automatic in operation and requires comparatively little attention. Rather large quantities of water are used and considerable power is consumed in handling this water, and in forcing the gases through the system. The washers are comparatively large and the initial expense of installation is large. In some instances, a problem arises as to the disposal of the muddy water, it often being illegal to allow this contaminated water to run into the streams, while in other instances water is not abundant and its use for gas cleaning may be prohibitive.

There is a hot-dry method of cleaning that promises to be very advantageous for the purpose of cleaning these gases. The electrical precipitation processes make use of a high-tension electrical discharge which sweeps out the suspended matter from the surrounding gas. The electrical method does not cool the gas, it precipitates the suspended dust in a dry state, thus making it easy to reclaim this material. The operation is practically automatic and the energy consumption is small.

The cleaning power of the electrical method is said to be practically complete, in many instances being as high as 99 to 100 per cent. The degree of cleaning is greater than that usually obtained by wet methods in general and is ample for stoves and boilers. Indeed the results of recent tests have indicated the probability that even with a single pass precipitator the gases would be cleaned to the degree required by internal-combustion engines.



GRATE FOR MARINE AND STATIONARY BOILERS

Grate Bar for Marine and Stationary Boilers

A new grate for stationary and marine boilers recently invented by William Codd is being manufactured by the Codd Tank & Specialty Co., Baltimore, Md. The grate fingers are similar to those on locomotive grate bars and shaking grates on stationary boilers with the exception that the tops of the fingers are rounded and that they taper to a point at the bottom. The rounded surface presented at the top is said to eliminate the possibility of slice bars, fire rakes and other tools from catching in the grate bars. The tapered design of the lower part of the fingers is claimed to aid combustion in that the draft from above the fire box is unhampered. The grates are made in units of single or double bars; in the latter case the two bars are joined by an offset connecting finger in the center of the bar and by connecting lugs at the ends which fit into the grate bar support of the boiler. A plan and side view of a double grate bar is shown in the accompanying illustration.

A bulletin published by American Railway Association shows that the railroads in the United States in the past 10 years lost $78,858,290 on account of car shortages and $1,057,957,977.50 because of car idleness. The figures compiled by the association for the 10-year period showed that the companies had added to their equipment 678,000 freight cars and that on an average of 96 days out of every 100 the railroads provided more cars than the shippers required to carry the traffic of the country. According to W. W. Atterbury, president of the American Railway Association, one railroad company increased its yard facilities in Philadelphia from a capacity of 3,800 to 7,000 cars and during this period the facilities of shippers for loading and unloading cars were increased from 1,400 to only 1,800. The bulletin carried a strong plea for consignees to unload cars promptly.

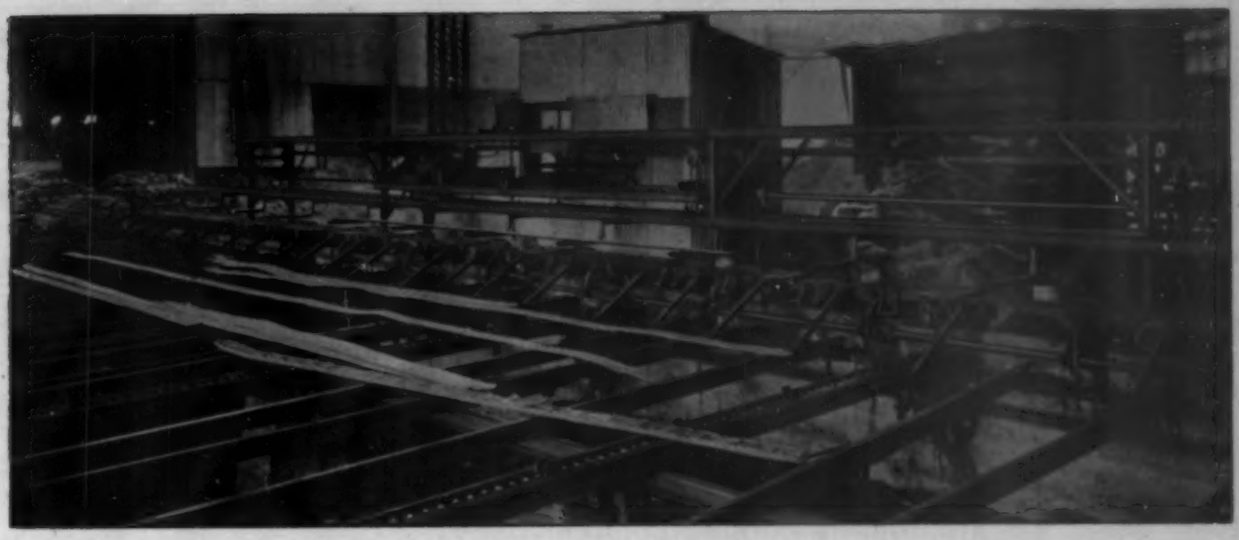


Fig. 1—General View of Cooling Bed Showing Automatic Bar Scale and Runout Tables

A Puddle Mill of Modern Design

Description of a Middle Western Mill Operated in Connection With a Wrought-Iron Bar Manufacturing Plant—Roll Train is Electrically Driven Through Silent Chain—Finished Bars Are All Weighed

IN AN article published in *The Iron Trade Review* July 8, 1915, describing the plant of the St. Louis Screw Co., St. Louis, the tendency toward up-to-date, scientific practices in the design and operation of bar-iron mills was discussed and it was pointed out that modern, competitive conditions demand as progressive a spirit in the iron business as in the steel industry. The recognition of this principle has led many bar-iron mill managers to strive for constant improvement in equipment and methods in their plants, and these efforts on their part are bearing fruit in both tangible and material directions. In common with other manufacturers of wrought iron bars who appreciate the necessity of keeping up with the times, the St. Louis Screw Co. has made extensive improvements to its plant in the past two years. The coal pulverizing and handling system, which was fully described in the article published July 8, 1915, has been remodeled, increased in capacity and improved in efficiency. In addition, the rolling mill department of the works has been rounded-out and balanced by the installation of the 20-inch puddle mill which was also mentioned in our previous article. This mill has a wide variety of features that appear to be worthy of considerable study. The puddle mill in a bar-iron plant occupies a position analagous to that of the blooming mill in a steel works. Its function is to break down and knead the rough, primary product and deliver an intermediate materfal that will enable the finishing mills to work to best advantage from both tonnage and quality standpoints. The new puddle mill of the St. Louis Screw Co. has been designed solely with the aim of fulfilling this purpose in an efficient manner.

The complete equipment of the puddle mill includes four heating furnaces fired with pulverized coal; a 60-inch squeezer;

FIG. 2—GENERAL ARRANGEMENT OF 20-INCH PUDDLE MILL AND 60-INCH SQUEEZER

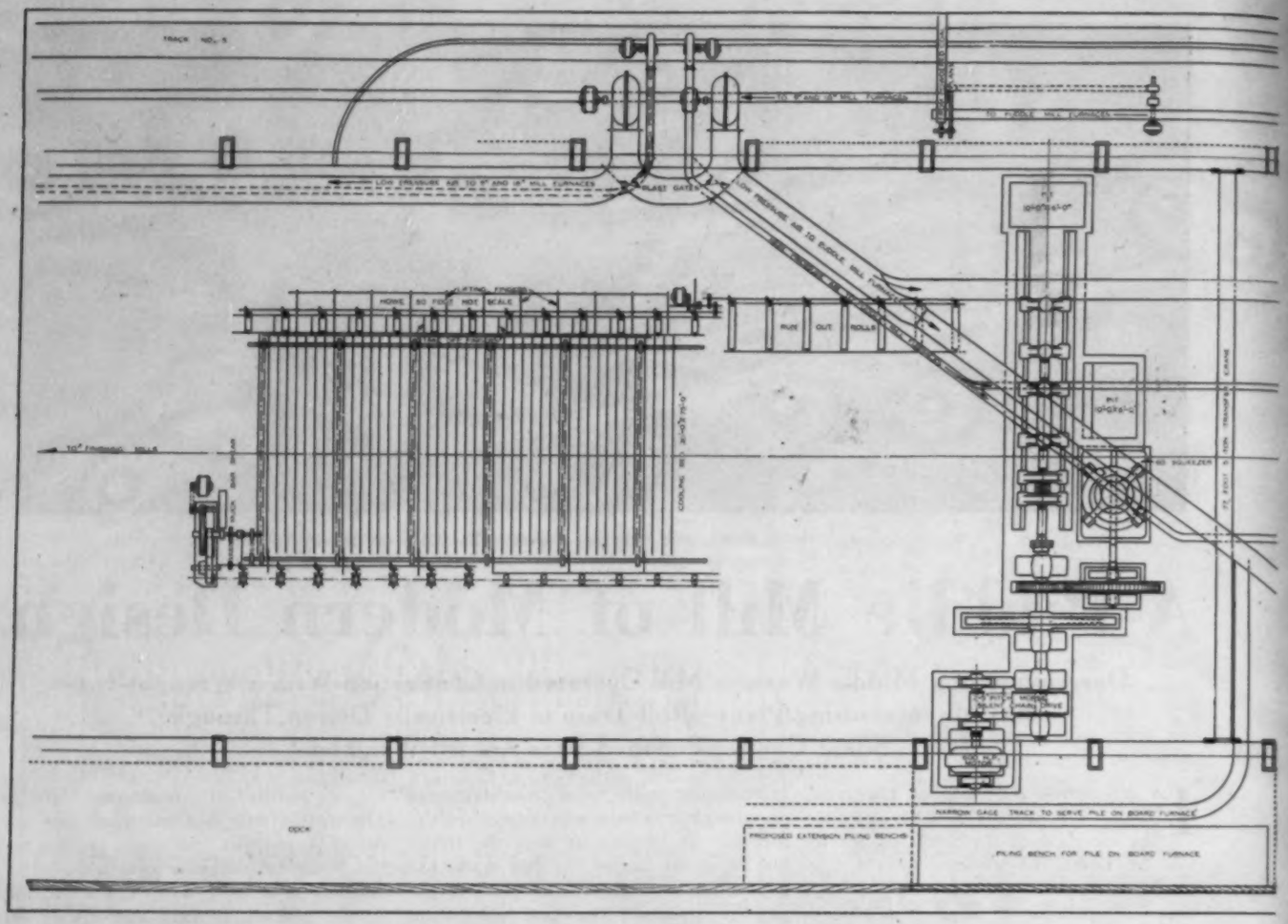


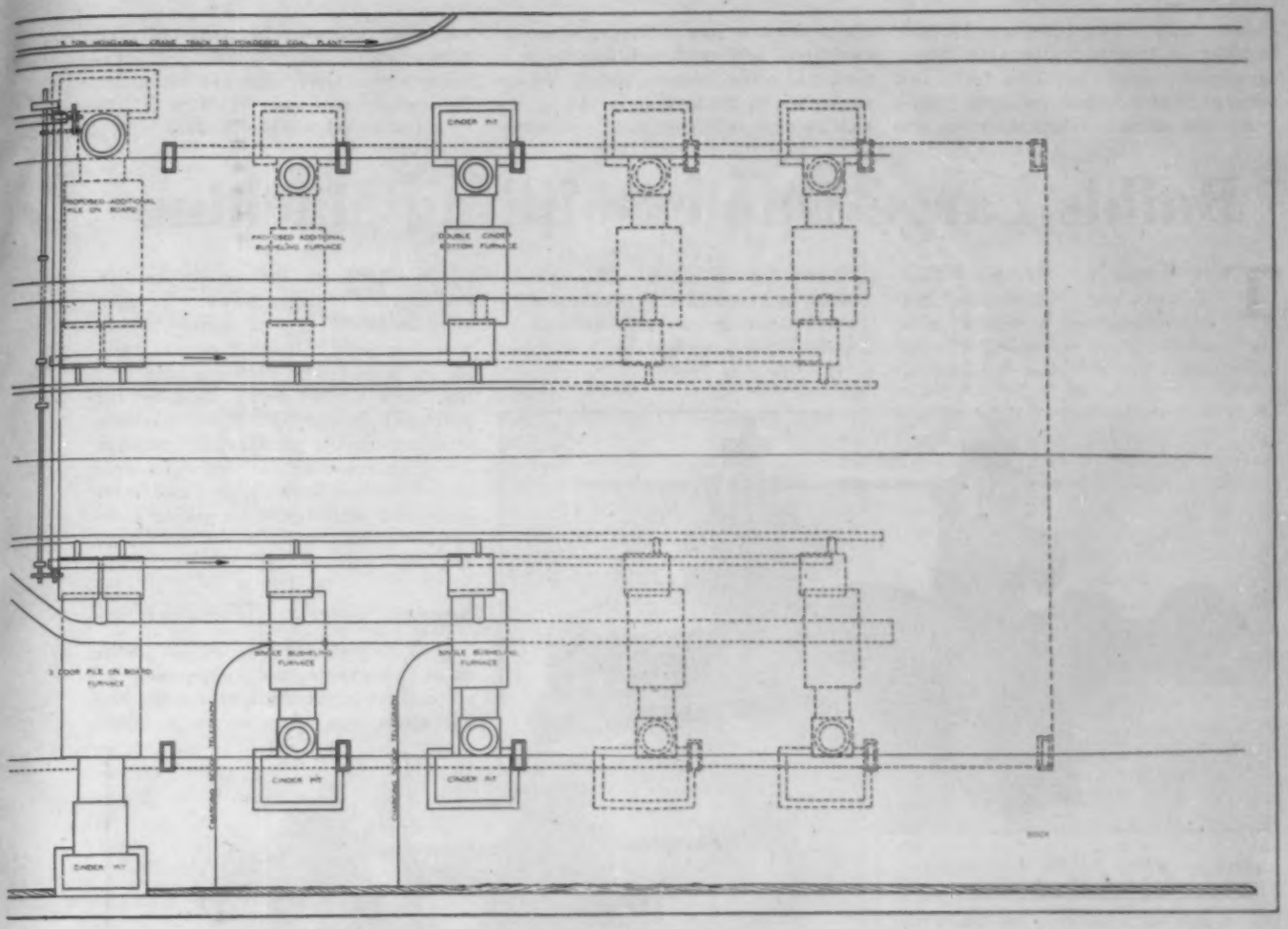
FIG. 3—SKETCH PLAN OF NEW PUDDLE MILL OF ST. LOUIS SCREW CO. SHOWING

FIG. 4—THE CINDER PITS ARE OUTSIDE WHERE THEY ARE ACCESSIBLE BY LOCOMOTIVE CRANE

a 20-inch, 3-high, 2-stand roll train driven by a 600-horsepower motor through a silent chain connection; a cooling bed with automatic bar-weighing scale; shears, crane, etc. The capacity of the mill, depending on the number of furnaces in operation, ranges up to 5,000 tons per month. It is designed to roll muck-bar flats from 3½ to 8 inches wide and billets 2, 2¼, 2¼ and 3 inches square.

The puddle mill is housed in an extension to the bar-piling building located along the west side of the scrap yard, which is 850 feet in length and 120 feet in width. The building is 80 feet in width and approximately 250 feet in length. It was erected in 1915 at the time the remainder of the plant was built. Very favorable fabricating and erection costs, judged from present standards, therefore were obtained.

The general arrangement of the plant is shown in Fig. 3. The furnaces are arranged in rows on either side of the north end of the building and space has been left for the installation of five or six additional furnaces, as future requirements may dictate. The mill, which is located immediately south of the furnaces, is placed with its long axis across



ARRANGEMENT OF FURNACES, SQUEEZERS, MILL, MOTOR, DRIVE, SCALE, HOT BED, ETC.

the building. The motor and chain drive are at the eastern end of the mill train. The cooling bed, with its long axis running north and south, is arranged so that it discharges directly to the bar-mill piling benches.

Furnaces Fired With Pulverized Coal

The furnace equipment includes two single, sand-bottom busheling furnaces, a double cinder-bottom furnace and a 3-door, pile-on-board furnace. The latter, as indicated in Fig. 3, is located nearest the mill. The hearth of this furnace is 6 feet 2 inches wide and 16 feet long. This furnace is provided with two burners. The busheling furnaces, which are adjacent to the pile-on-board furnace, are 4 feet 6 inches deep. The double cinder-bottom furnace, which is on the west side of the building, is 6 feet 6 inches deep. The busheling furnaces are provided with telphers for handling the charging scoops. The telpher rails extend out over the charging dock outside the building. The furnaces are spaced on 18-foot centers.

The coal supply and burning apparatus is virtually the same as that described for the bar-mill furnaces in the article published in *The Iron Trade Review* July 8, 1915. The coal is fed from the pulverizing plant by a system of longitudinal and cross conveyors the general arrangement of which is clearly shown in Fig. 3. The same illustration shows the arrangement of the low and high pressure blast pipes that are an essential part of the fuel charging system. Cinder pits are located at the end of each furnace outside the building. These pits are filled with water which granulates the cinder and puts it in such condition that it may be readily handled by a locomotive crane. The piling bench for the pile-on-board furnace is also served by a locomotive crane operating on a track in the scrap yard.

The details of the arrangement of the mill, squeezer, chain drive and motor are clearly shown in Figs. 2 and 3. A 60-inch squeezer has been provided. It is driven from the main mill spindle by a pair of cut, spur gears that give a speed reduction of three to one. The squeezer shaft operates at 20 revolutions per minute. The squeezer head runs seven revolutions per minute. The squeezer is so arranged that the ball slides down a set of guides into the first pass of the mill practically without attendance. The scale from the squeezer is discharged into a pit 12 feet long, 10 feet wide and 6 feet deep from which it is removed by a grab bucket suspended from the traveling crane. Both the mill and the squeezer were built by the Lewis Foundry & Machine Co., Groverton, Pa.

Silent Chain Mill Drive

The distinctive features of the mill is the method of drive. The power is furnished by a 600-horsepower Allis-Chalmers mill type, alternating current, 2,200-volt, 25-cycle, 3-phase motor. The motor speed is 300 revolutions per minute. This is reduced to 60 revolutions per minute at the mill spindle by means of a Morse silent chain drive. A 38-inch, 2½-inch pitch chain is provided. The distance between the centers of the chain sprockets is 102 inches.

Between the driven sprocket and the pinion coupling is a 20-foot flywheel that weighs 40 tons. The flywheel, of course, is so placed that its energy is transmitted to the squeezer as well as to the mill.

The mill itself consists of a stand of pinions and two stands of 3-high,

20-inch rolls. The rolls are 84 and 78 inches in length, respectively. Their peripheral speed is 311 feet per minute. The housings, pinions, couplings and general arrangements are of standard design. The mill is designed to roll an 8-inch bar ⅝-inch thick in seven passes and a 5-inch bar 9/16-inch thick in nine passes. A scale pit similar to that connected with the squeezer is placed at the outer end of the roll train. It connects with a sewer that extends under the roughing rolls. This pit, like

(*Continued on page 529*)

Builds Large Duplex Milling Machine

THE Newton Machine Tool Works, Inc., Philadelphia, has just completed a duplex milling machine which is provided with more power control than is usual in the design of this type of machine. As shown in Fig. 1, which is a view of the front of the machine, the spindles move on vertical guides and the uprights which carry spindle saddles slide on vertical guides on the bed of the machine. The spindles have reversing speeds and reversing fast power traverse. The spindle saddles are provided for independent or simultaneous adjustment and this arrangement also holds true for the feed control of the uprights. The spindle saddles have narrow guide alignment and provision has been made for bolting them rigidly at any desired height. The saddles are coun-

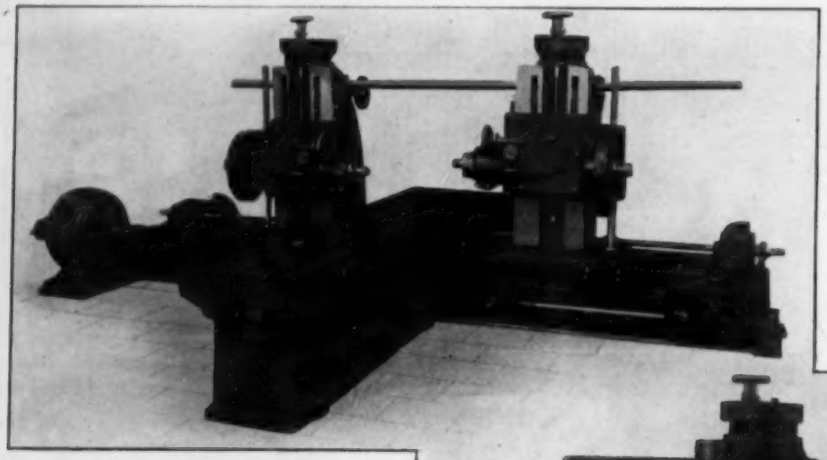


FIG. 1—FRONT VIEW OF DUPLEX MILLING MACHINE

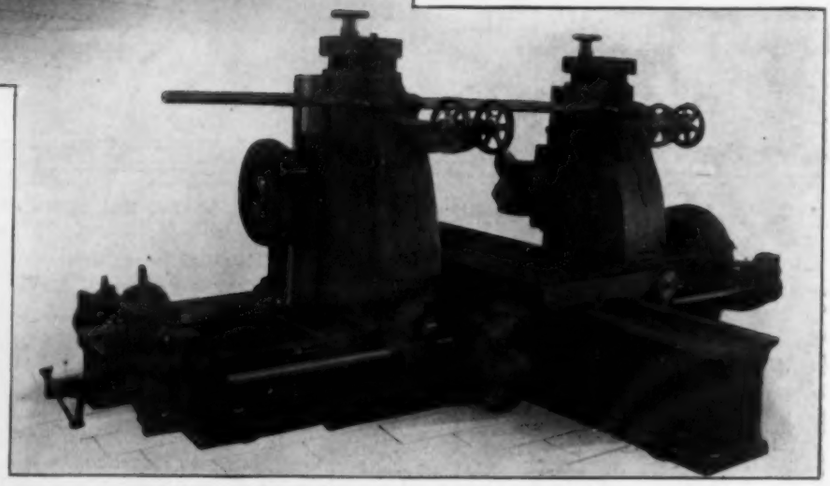


FIG. 2—REAR VIEW OF DUPLEX MILLING MACHINE

The spindles are driven through worm and worm wheel, both encased for continual lubrication. The drive for each spindle is independently clutched at the inside of the driving work wheel sleeve so that each milling cutter may be operated independently or in unison. The spindles accommodate a 3-inch straight plug and are arranged to drive the cutter by means of 1¼-inch face keys. When desired, the spindle can be bored taper as large as No. 6 Morse and drilled through for a cutter retaining bolt.

The drive is from a 20-horsepower Fort Wayne Electric Co. motor operating at from 300 to 900 revolutions per minute at 230 volts. Nine sliding gear changes provide a wide range inches per minute, and for the saddles, 6.10 to 63.4 inches per minute.

The width of the table over the finished surface is 42 inches; clearance between uprights, 106 inches; length of table over all, 14 feet; length of table to mill, 12 feet 6 inches; length of base over all, 18 feet; distance between face of uprights to center spindles, 6¾ inches; distance from center of spindles to table (maximum), 35 inches, (minimum) 2 inches.

A machine used to count a definite number of screws and delivering them into a package was recently developed by the Reynolds Pattern & Machine Co., Moline, Ill. It is used in such work as hardware manufacture, where it is necessary to pack a certain number of screws with each machine sent out, these screws being used by the purchaser in assembling the machine. In operating the machine, the package is set on a pad on the end of a lever located below a chute, and the lever depressed, whereupon the proper number of screws slide down the chute into the package.

Screw Thread Tolerances

The establishment by law of tolerances, clearances and allowances of screw threads produced by manufacturing plants was discussed at a recent hearing in Washington. The authority of control is proposed to be vested in the war and the navy departments. The importance of uniformity of screw threads was emphasized by the experience of Great Britain, which according to an authority, suffered a loss of money and time at the outbreak of the war due to insufficient standardization of screw thread tolerances. The standard of fine pitch threads established in this country in 1906 by the Society of Automobile Engineers has operated most effectively, but according to Dr. Stratton, of the bureau of standards the scope of this standardization should be extensively broadened.

Before the standards are finally formulated, discussion by both consum-

ers and manufacturers as well as by the engineers of the government plants will be invited. The proposition of establishing a series of standards for various grades of work is also being considered. Accurate measurement of screw threads in commercial practice has developed slowly. It is believed now, however, that through concerted effort of representative experts in government and in civil life the complexity of determining the accuracy of screw products will be simplified and that the government specifications for high brade workmanship will be met by manufacturers.

Boring, Milling and Drilling Machine

A FLOOR type of boring, milling and drilling machine recently placed on the market by the Landis Tool Co., Waynesboro, Pa., is shown in the accompanying illustrations. The machine is driven from a motor mounted on top of the column directly connected to the main drive shaft, thus eliminating belting. The spindle drive is controled by a pair of friction cone clutches located at the back of the saddle and accessible for adjustment. This arrangement provides a reversal of the spindle for back facing and tapping. The meshing of the driving pinion for the spindle, with a gear face of large diameter cut directly on the face plate, is said to effectually eliminate spindle torsion, a frequent cause of chatter marks when milling. The front end of the spindle slides through an adjustable spindle sleeve but the spindle rotates in another adjustable bearing on the external diameter of the sleeve.

A very prominent feature of this tool is the sensitive concentric screw feed of the spindle, accomplished by means of a differential train of gears. This method of feeding permits continuous traverse of the spindle without resetting. The feed is applied between the main bearings, and requires no overhanging support at the end of the saddle. The spindle is reversed by a long bronze nut which engages a square thread and which has a bearing only on the sides of the thread. It will be seen that this arrangement provides a very long bearing and as both nut and bearing rotate together at the same rate of speed, except when the feed is engaged, the possibilities of wear are minimized. The thrust of the spindle when milling is taken in a rigid manner, directly on the main saddle casting, and is said to be entirely independent of the end thrust of the spindle for boring. The feed and speed gear trains are contained in a single gear box and are shown in Fig. 3.

Twelve changes of speed and 12 changes of feed are embodied in the design. All feeds are at the same rate per revolution of spindle whether applied to the spindle, saddle or column traverse, and no two of them can be engaged at the same time. Any of the 12 feeds can be applied to any of the 12 spindle speeds, making in reality 144 actual rates of feed. Rapid power traverse independent of the regular feeds is provided for the spindle, saddle and column in every direction. The machine can be instantly started and stopped, or reversed with one lever, independent of the main drive or motor.

Gear shifts are all of the sliding transmission type, and are tightly enclosed in accordance with state law requirements for the safety of the operator. The traversing gears are located between the ways and close to the guiding side. Gears and shifts are made of chrome nickel steel. The spindle is made of high carbon hammered crucible steel. The saddle parts are oiled by the syphon system. The counterweight for the saddle operates inside the column as a protection to the operator. When a swivel table is used on this machine the different sides of work may be finished without resetting. The machine has been designed especially to meet the requirements of ship yards, engine works, navy yards and turbine works and to handle a wide range of heavy machine work.

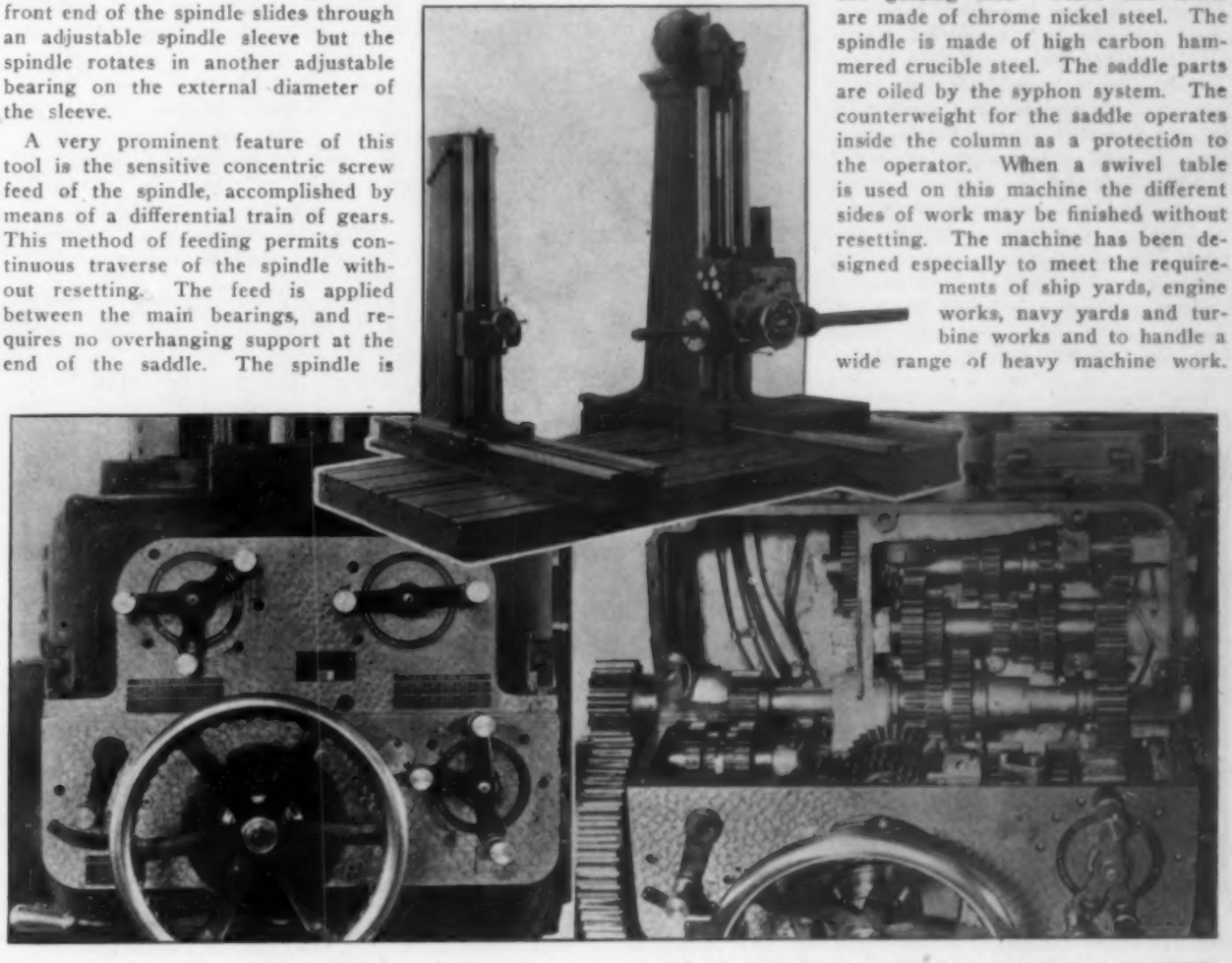


FIG. 1—SHOWING CONTROL OF SPEEDS AND FEEDS. FIG. 2—FLOOR TYPE BORING, MILLING AND DRILLING MACHINE
FIG. 3—VIEW OF INTERIOR OF GEAR BOX

Isolation Reduces Machine Vibration

The Demand for Silence in Certain Kinds of Buildings Has Resulted in the Development of a Substance for Isolating Machinery to Suppress Noise and Vibration in Manufacturing Plants

NOISE and vibration have long been recognized as undesirable, but comparatively little has been done in past years toward their reduction or elimination, except in hospitals, apartment houses and hotels. In such institutions the demand for quiet has been so insistent that sound-deadening measures have been imperative. Recent investigations, however, as to causes and remedies for industrial inefficiency have brought to light the fact that vibration and noise in manufacturing plants are quite objectionable factors from the standpoint of efficiency and economy.

Effects of Noise

Noise is fatiguing. To demonstrate this statement it is only necessary for one who is unaccustomed to the terrific clatter of a boiler shop to stand near a riveting machine in action. In a very short time he will experience a decided sense of fatigue. Fatigue is responsible for a surprisingly large proportion of the accidents that occur daily in manufacturing plants. Furthermore, noise is responsible for the misunderstanding of orders and consequent errors. It increases nervous strain, diminishes efficiency and production, distracts the attention of employes and makes it more difficult for them to concentrate on the task in hand. In almost every instance where employes have been transferred from noisy to quiet locations, the quality and quantity of work have been increased greatly.

Vibrations, aside from the fact that they cause most industrial noises, are also a constant menace not only to the machines producing them, but to the buildings that house them. Their continued action may weaken the structure and, in some instances, has even caused complete collapse.

It is necessary to know something about the way in which vibrations are transmitted, before they can be counteracted effectually. Vibrations are usually complex in nature, due to the constant change in the direction of the moving parts that produce them. Generally speaking, however, the direction of vibrations will be approximately the same as the direction of their generators. An engine or machine working horizontally will send out vibrations in a horizontal direction, and a vertical engine or machine will distribute its vibrations in a vertical direction.

Causes of Vibration

Every machine, due to the difficulty of balancing its moving parts perfectly, sends out some vibrations. Part of these are given up directly to the surrounding air and are gradually dissipated without any very decided change in their direction. The elimination of noise resulting from such vibrations can be accomplished only by completely enclosing the machine so that no sound waves may escape.

Other vibrations are transmitted through the machine to the floor, thence to the walls, and finally to the ground. As foundation vibrations are the chief producers of noise, the operation of machinery will be rendered much more quiet if these vibrations can be entirely or almost entirely eliminated.

From information furnished by the Armstrong Cork Co., Pittsburgh.

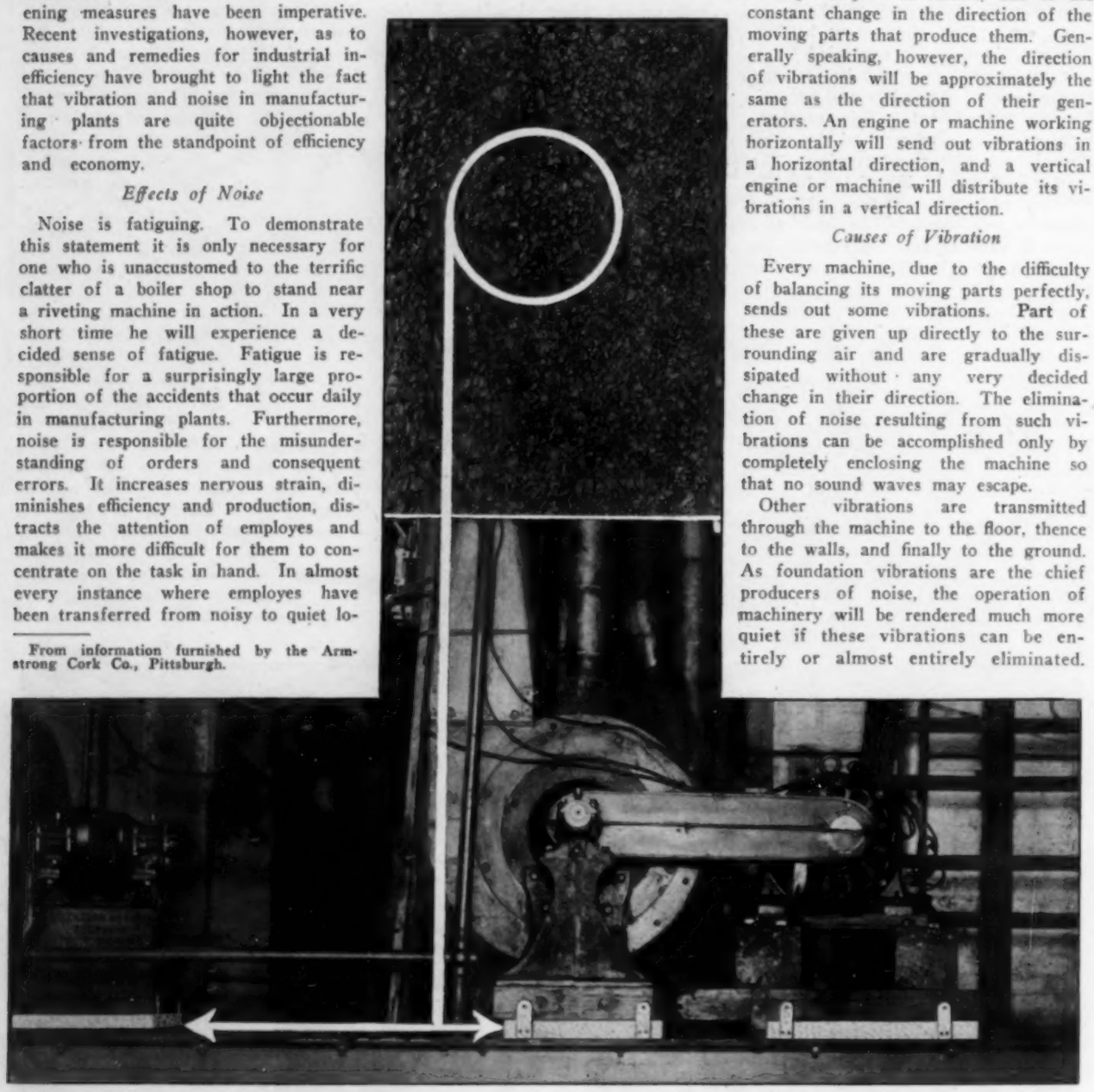


FIG. 1—A SLAB OF SHEET CORK SUCH AS IS USED FOR ISOLATING MACHINERY. FIG. 2—THE PRACTICAL APPLICATION OF SHEET CORK ISOLATING MOTOR-DRIVEN BLOWER—THE CORK IN THIS CASE IS INSTALLED BETWEEN THE BED PLATES OF THE MACHINES AND THE FLOOR

There are two methods by which vibrations may be suppressed: First, by anchoring the machine to a foundation too massive to be set in motion by the vibrations generated by its operation; second, by isolating the machinery, by placing it upon a material of such structure that the vibrations will not readily pass through it, but will be absorbed.

Requirements of Machinery Isolation

Any substance suitable for isolating a vibrating machine must be resilient, permanently elastic, strong in structure, damp and moisture proof, easy to install and reasonable in price. Cork is a material well suited by nature for this purpose and when pure granulated cork is compressed in metal molds and baked at a moderate temperature the result is a commercial isolating substance which fulfills the requirements listed above. The Armstrong Cork Co., Pittsburgh, has developed a commercial cork for isolating purposes. In the process of manufacturing this material, the baking brings out the natural waterproof gum or rosin of the cork, cementing the granules firmly together and making the use of any artificial binder unnecessary. After baking, each sheet is trimmed and sanded to insure uniform size and thickness. Fig. 1 is a view of a slab of cork made by the Armstrong Cork Co., and Fig. 4 shows this material as it appears under a microscope.

The structure of natural cork consists of myriads of minute air-cells separated from each other by thin walls

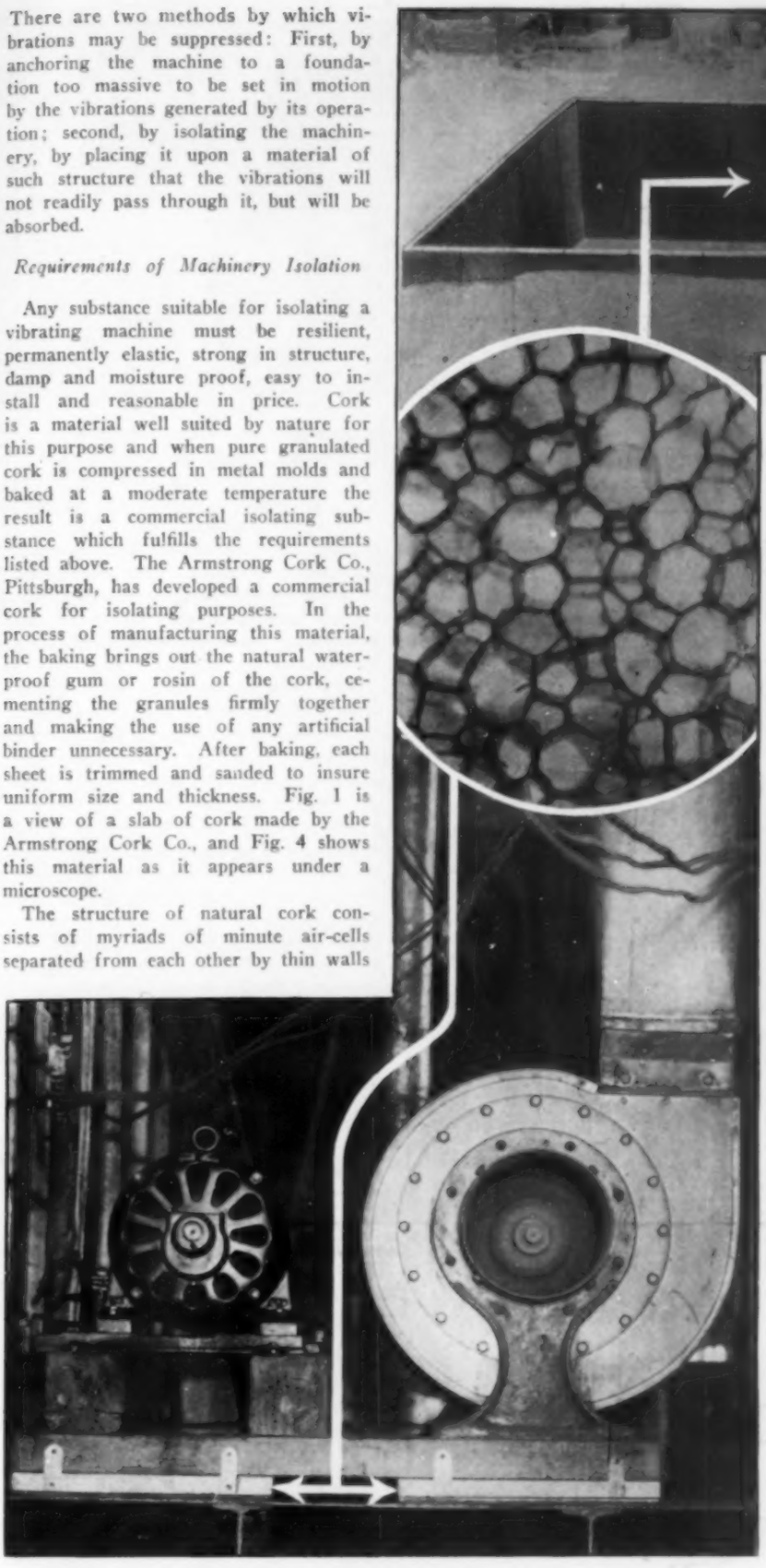


FIG. 3.—ANOTHER CASE OF ISOLATING A MOTOR-DRIVEN BLOWER UNIT WITH CORK—THE MACHINES IN THE ACCOMPANYING ILLUSTRATION ARE NOT ANCHORED TO THE FLOOR. FIG. 4—A SAMPLE OF NONPAREIL CORK UNDER THE MICROSCOPE SHOWING THE CELLULAR FORMATION

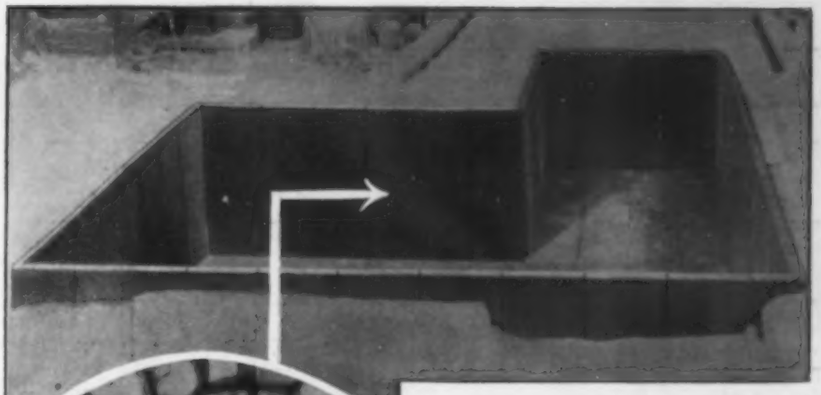


FIG. 5—A FOUNDATION PIT FOR OIL ENGINE ISOLATED ON ALL SIDES AND THE BOTTOM WITH CORK

of tissue. Each of these microscopic cells contains a tiny bit of air, and each one is, moreover, sealed up tight and rendered impervious to moisture. The innumerable cells of the cork in reality form a large air cushion that yields to practically every compression force exerted upon it. The air contained in these cells is confined in such small particles that they are not readily set in motion, and the vibration waves are gradually broken up instead of being transmitted to the adjacent or supporting structure. The pressure to which the granulated cork is subjected goes principally to fill up the voids between the granules, while the baking process actually increases the isolating efficiency of the raw material by driving off the sap, thus increasing the volume of confined air and by coating the surface of each separate granule with a thin film of the natural water-proof gum, affording an effective barrier against the entrance of moisture. Any substance, naturally resilient, that became saturated with water, would lose its isolating quality and become a conductor of vibrations.

Value of Elasticity

Resiliency is but the first requirement for a machinery isolating material. Elasticity is of almost equal importance. Unless an isolating material has considerable structural strength, it can only be used in connection with the very lightest machinery. The loads encountered under heavy units will break down its resistance and render it unfit for use in a very limited period. To determine the suitability of cork isolation a series of tests were made by the Pittsburgh Testing Laboratory, in March, 1914. The test pieces were 8 inches square, and 1, 1½, 2, 3, 4 and 6 inches thick, respectively. Loads were applied to steel plates 4 inches square, laid on the sheets—not to the whole surface of the cork. This was done so that the shearing action of the edges of the plates could be observed. Actual work-

Compression Tests of Isolating Cork

2-INCH CORK.

Load in pounds applied on 4-inch square plate on top of cork	Load in pounds per square foot applied on plate	Compression of cork in inches	Contraction of cork around top edge of sheet, due to-compressing plate into the cork, in inches	Depth of depression of the plate in cork after the load was released, in inches	Remarks
400	3,600	0.04	....	....	
800	7,200	0.08	....	....	
1,200	10,800	0.11	....	....	
1,600	14,400	0.16	1/64	....	Slight fracture in cork
2,000	18,000	0.22	....	....	
2,400	21,600	0.28	3/64	....	
2,800	25,200	0.32	....	....	
3,200	28,800	0.40	3/64	1/64	Break in cork
3,600	32,400	0.46	....	....	
4,000	36,000	0.51	1/16	....	
4,400	39,600	0.56	....	....	
4,800	43,200	0.64	1/16	1/8	

4-INCH CORK

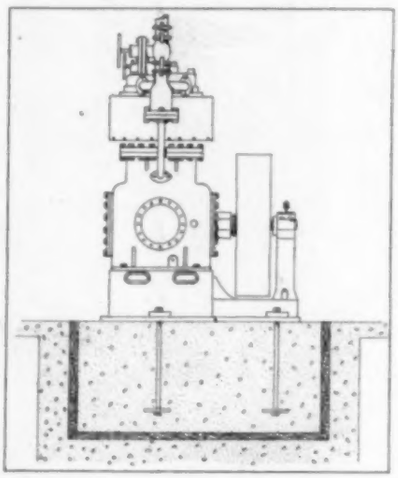
Load in pounds applied on 4-inch square plate on top of cork	Load in pounds per square foot applied on plate	Compression of cork in inches	Contraction of cork around top edge of sheet, due to-compressing plate into the cork, in inches	Depth of depression of the plate in cork after the load was released, in inches	Remarks
400	3,600	0.02	....	....	
800	7,200	0.08	....	....	
1,200	10,800	0.14	....	....	
1,600	14,400	0.24	1/32	....	
2,000	18,000	0.34	....	....	Slight fracture in cork
2,400	21,600	0.44	3/32	....	
2,800	25,200	0.52	....	....	
3,200	28,800	0.60	1/8	1/16	Break in cork
3,600	32,400	0.70	....	....	
4,000	36,000	0.82	3/16	....	Badly broken
4,400	39,600	1.00	....	....	
4,800	43,200	1.16	3/16	1/4	

ing conditiors were approximated since in practice it is seldom that the bottoms of machinery bases present perfectly flat surfaces. The results of two of these tests are shown in the accompanying tables.

The ability to resist successfully the action of moisture is of two-fold importance in an isolating material, since it makes for long life in service, and as was mentioned before, water is a good conductor of sound waves. Hence, any substance is practically worthless as an isolating material after it has become water-soaked. In describing the process of manufacture of cork isolation, it has been pointed out that the granules are coated with the natural waterproof gum or rosin of the cork and the effectiveness of this coating even under abnormal conditions is very marked.

Block cork for machinery isolation may be sawed or cut into the desired shape as readily as lumber, and where large pads are needed, they can be made in sections and cemented together. The cork can be supplied in many different thicknesses, eliminating the necessity of building up the material in layers.

For many years cork has been used for absorbing the vibrations of fans, motors, refrigerating and other machines, in hospitals, clubs, apartment houses, etc., where quiet operation is absolutely necessary to the comfort of the occupants. Ducts for ventilating or other purposes are excellent conductors of sound. Yet even when it is necessary to place machines directly over them, the apparatus can be isolated quite effectively with cork isolation.



The densities of this cork range from 1.10 pounds per board foot (12 x 12 x 1 inches) to 1.66 pounds per board foot. Densities from 1.10 pounds to 1.33 pounds are either light or medium color. The 1.50 and 1.66 pounds density stocks are in three colors, light, medium and dark. Light color is harder than medium color; medium color is slightly harder than dark.

Generally speaking, the density of cork for isolating various types of machines should be as follows:

There are two general methods of installing isolating cork. In the first method the foundation pits are finished with concrete and lined with cork on the bottom and sides. This type of installation is shown in Fig. 5. The foundation is then poured in on top of the cork, which should be protected with suitable waterproof insulating paper.

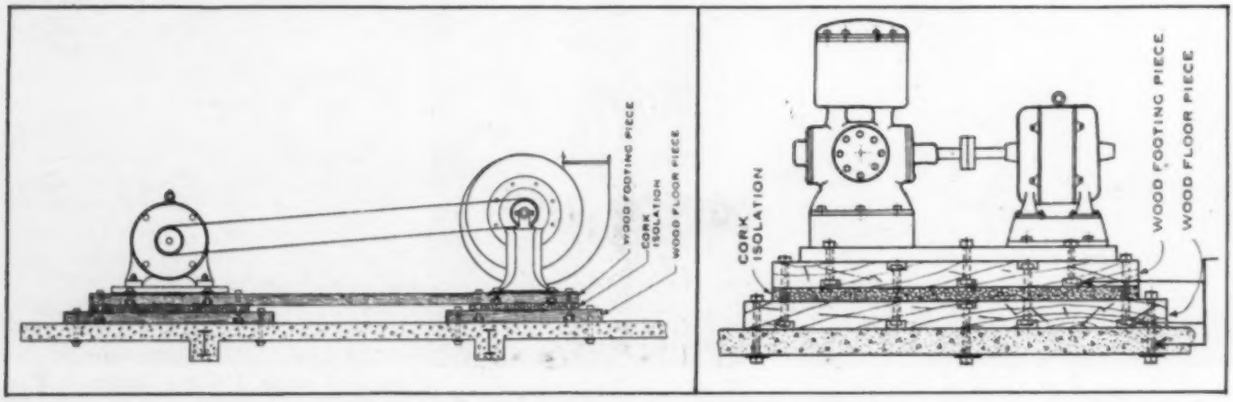
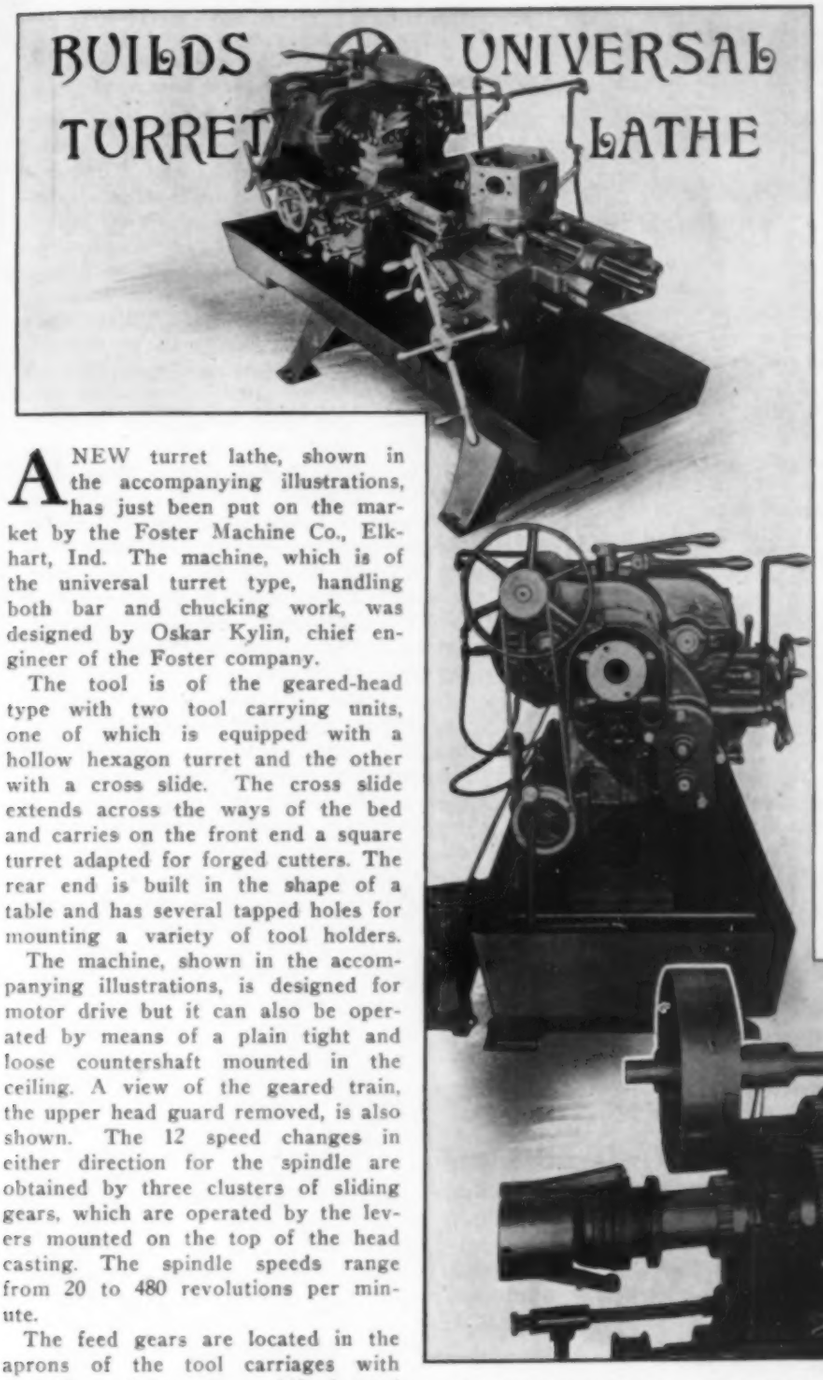


FIG. 6—TWO OR MORE UNITS NOT ON THE SAME BED PLATE, WOOD OR CONCRETE FLOORS AND CEILINGS. FIG. 7—DETAILS OF METHOD OF ISOLATING MACHINERY FOUNDATIONS WITH CORK. FIG. 8—TWO OR MORE UNITS ON THE SAME BED PLATE, WOOD OR CONCRETE FLOORS AND CEILINGS

BUILDS UNIVERSAL TURRET LATHE



A NEW turret lathe, shown in the accompanying illustrations, has just been put on the market by the Foster Machine Co., Elkhart, Ind. The machine, which is of the universal turret type, handling both bar and chucking work, was designed by Oskar Kylin, chief engineer of the Foster company.

The tool is of the geared-head type with two tool carrying units, one of which is equipped with a hollow hexagon turret and the other with a cross slide. The cross slide extends across the ways of the bed and carries on the front end a square turret adapted for forged cutters. The rear end is built in the shape of a table and has several tapped holes for mounting a variety of tool holders.

The machine, shown in the accompanying illustrations, is designed for motor drive but it can also be operated by means of a plain tight and loose countershaft mounted in the ceiling. A view of the geared train, the upper head guard removed, is also shown. The 12 speed changes in either direction for the spindle are obtained by three clusters of sliding gears, which are operated by the levers mounted on the top of the head casting. The spindle speeds range from 20 to 480 revolutions per minute.

The feed gears are located in the aprons of the tool carriages with exception of one gear shift located in the gear box. This sliding gear cluster is operated by means of a plunger which is conveniently located. The gear box also carries a forked lever for the operation of the automatic chuck.

The feed changes are located in the apron and variations are obtained by means of sliding gears operated by plungers. The sliding gear clusters are made of chrome nickel steel and the driving pinion which engages the rack mounted on the front side of the bed is also made of the same alloy. The gear train is driven from the feed rod by means of a worm and gear. A square turret for carrying four forged cutters is mounted on the cross slide. The vertical lockbolt is operated by the handle mounted on the top of the square turret. The forward movement of this lever when the lockbolt is engaged, binds the turret rigidly to its seat. The rear end of the cross slide has several tapped holes for mounting standard and special tool blocks or tool holders.

ILLUSTRATIONS OF A UNIVERSAL TURRET LATHE WHICH EMBODIES A NUMBER OF FEATURES OF NEW DESIGN

Modern Puddle Mill

(*Continued from page* 524)

the squeezer pit, is served by a grab bucket operated from the crane.

The finished muck bars are delivered from the last pass of the mill onto the runout table shown in Fig. 3. This table, which is 35 feet long,

SPINDLE SPEEDS

R.P.M.	20	27	36	48	64	86	111	149	200	267	355	480
LEV. A	RIGHT	RIGHT	RIGHT	RIGHT	RIGHT	RIGHT	LEFT	LEFT	LEFT	LEFT	LEFT	LEFT
LEV. B	LEFT	LEFT	LEFT	RIGHT	RIGHT	RIGHT	LEFT	LEFT	LEFT	RIGHT	RIGHT	RIGHT
LEV. C	LEFT	RIGHT	CENTR'L	LEFT	RIGHT	CENTR'L	LEFT	RIGHT	CENTR'L	LEFT	RIGHT	CENTR'L
	SPEED OF PULLEY - 510 R. P. M.											

SPINDLE SPEEDS OF UNIVERSAL TURRET LATHE

has seven live rollers each 6 feet long and 10 inches in diameter. The bars are discharged from the runout table onto a hot-bed or scale table where they are weighed before being thrown out onto the bed. This table has 13 live rollers, 2 feet long and 10 inches in diameter. Both it and the runout table are driven by a 10-horsepower Westinghouse, 440-volt, 3-phase motor running 720 revolutions per minute. The motor is connected to the table gears by a silent chain drive.

For weighing the bars, a 50-foot Howe suspension type scale with automatic dial is provided. This scale has a capacity of 1,000 pounds. Its principal features are shown in Fig. 1. Lifting fingers of standard type, placed between the table rollers, are utilized to hoist the bars to the scale. The scale also is provided with a dumping mechanism for throwing the bars out onto the cooling bed. Every bar is weighed, thus affording a constant check on the production. The weighmaster controls the scale and the tables.

The cooling bed is 30 feet wide and 65 feet long. It is of standard construction and is equipped with a chain-type pull-over. The dogs on the pull-over chain are spaced on 4-foot centers. The pull-over delivers the cooled bars to a shear table provided with seven 18 x 10-inch, spool-shaped live rollers driven from the shear shaft.

After being cut to the proper size in a standard lever shear, the finished muck bars are carried to the bar-mill piling bench by a 5-ton electric traveling crane. The crane runway extends from the furnaces on the north, over the mill, squeezer, and hot bed, to the piling bench at the south end of the building.

Japanese Steel Plant

A new steel plant will be constructed in Manchuria early this year by the South Manchuria Railway Co., according to a report from the American consul general at Mukden, China. It will be operated in connection with an iron mine that is located in the An Shan Chan region, between Liaoyang and Heicheng.

It is expected that the steel plant will produce at least 150,000 tons annually at first. An abundant supply of lime is available not far from the iron mine and most of the coke will come from the Fushun mines, which are likewise owned by the South Manchuria railway. As the cost of labor is comparatively low and transportation facilities adequate, the whole scheme should be worked on a most economical basis. The railway company has acquired a large tract of land, so that operations may be indefinitely extended. The work will begin some time in April, soon after the spring thaw.

Brings Out High-Speed Hack Saw

The Ellis-Smith Mfg. Co., Buffalo, N. Y., has recently perfected a high-speed hack sawing machine which is designed to take 4 x 4-inch stock. The saw arm carries a 9-inch blade and is driven by a crank working on V-bearings. The saw arm is equipped with the usual sliding weight to regulate the pressure and embodies an automatic stopping device. The machine is 24 inches overall, 6 inches wide and 10 inches high. The drive is by means of a 10 x 2-inch pulley. The hack saw, with the blade in the raised position, is shown in the accompanying illustration.

HACK SAW SHOWING BLADE RAISED

Settle War-Order Dispute

The Bethlehem Steel Co. and the British government have settled their dispute over a Russian shell contract, said to amount to more than $50,000,000 and shipments will not be interrupted, Charles M. Schwab has announced. It was reported last month that Great Britain, which is financing Russia's purchase of munitions, had been holding up payments on shells aggregating more than $10,000,000 in value, owing to a disagreement over the time of delivery. The Bethlehem company has been compelled to ask for extensions of time at various intervals, not through any fault of its own but because the Russian government was slow in sending its specifications. Under the new arrangement the company will have about a year to complete the entire order. As a result of the settlement Bethlehem has sold $50,000,000 of its own 2-year notes, secured in part by British short term notes.

Big Purchases

Of Benzol Continue and Fears of Shortage Are Expressed

New York, Feb. 27.—Further heavy buying is continuing in pure benzol and there is more talk of a probable shortage. Some large purchases, estimated at not less than 200,000 gallons monthly, are still overhanging the market. These are wanted by domestic manufacturers of high explosives to fill foreign contracts. Last week in closing for one lot of 200,000 gallons for delivery by April, it was necessary to call upon three or four makers in order to get the quantity. This sale was for war purposes. Additional buying also is being done by the paint, dye and rubber manufacturers and by other makers of products for more peaceful uses. The market is hardening as the supply shrinks but prices are unchanged at 55 to 60 cents, per gallon, for both spot and contract. Toluol also is tending upward and some large sellers who were naming $1.50 per gallon on contracts now ask $1.75. A little spot supply is available and carloads still may be had at $1.75. Phenol shows softness because of a moderate amount of excess product. New demand is light. A number of expiring contracts will be up for renewal within the next 90 days. Prices range from 45 to 50 cents per pound. With the supply greatly in excess of the demand, solvent naphtha is very weak. Prices fluctuate widely. Quotations of from 16 cents to 25 cents per gallon are reported.

Various countries are demanding sulphate of ammonia for delivery later but business is blocked by the shortage of vessels. Russia, France, the East Indies and other countries have asked for 500 to 1,000-ton lots. Domestic consumers continue to buy early carloads at the current high prices. Additional benzol by-product prices may be found on page 552-A.

The Bethlehem Steel Co. has purchased the limestone quarries of the New Jersey Lime Co., at McFee and Hamburg, N. J., for $72,837.76. The New Jersey Lime Co. was organized in 1901. The Bethlehem company owns land adjacent to the quarries and will hold the new property for future operations.

The new open hearth steel plant of the Ashland Iron & Mining Co., Ashland, Ky., is ready for work; but, because of delay in getting shipments of material, rolling will not be begun for several weeks. The plant will employ more than 1,000 men.

Mining Engineers Meet in New York

Practical Papers on Blast Furnace Practice and Manufacture of Iron and Steel Bring Out Enthusiastic Response—Pressure for Big Production Not a Bar to Progress

IN SPITE of the tremendous pressure resulting from an unprecedented demand for tonnage, the virility and resources of the American iron and steel industry are such that there is a liberal surplus of energy available for the study of scientific and operating problems leading to improved methods, reduced costs, and further conservation of our natural resources. This was clearly brought out in the proceedings of the annual meeting of the American Institute of Mining Engineers, which was held in the Engineering Societies building, New York, from Monday to Thursday of last week. The entire program was replete with papers of tangible, practical value. The sessions on blast furnace practice and the manufacture of iron and steel on Tuesday and Wednesday were particularly noteworthy for the wealth of ideas based on actual operating experience.

It was evident, also, from the character of the participants in the discussions, that the leaders in the iron and steel industry are willing to sacrifice large personal interests in a time of unusual activity for the purpose of adding to the common fund of information and progress. Five papers were presented on the manufacture of iron and steel, five on blast furnace practice, 10 on the metallography and heat treatment of steel, and six on iron ore and miscellaneous subjects relating to the iron and steel business. All of the sessions were attended by a large number of executives and responsible operating heads. In many cases the written discussions had been received in sufficient time to permit of their being printed in pamphlet form. This innovation was appreciated by those in attendance.

The details of the annual election of officers and directors resulting in the choice of Philip N. Moore, of St. Louis, as president for the ensuing year, were reported in last week's issue of *The Iron Trade Review*. The annual dinner-dance was held at the Astor hotel Tuesday evening, Feb. 20. L. D. Ricketts, the retiring president, acted as toastmaster. President-elect Moore spoke briefly, outlining the policies he expects to pursue during his administration. The last official act of President Ricketts was to announce the unanimous election of Herbert C. Hoover to an honorary membership in the Institute, in recognition of his services on the American Commission for Belgian Relief, in which he has taken a prominent and active part. In addition to the annual dinner, the usual college reunion and smoker was held Monday evening. At this function a special, large table was reserved for the graduates of the school of experience. Washington's birthday was celebrated by an excursion by special train to the United States military academy at West Point.

Practical Session on Blast Furnace Operation

THE session on blast furnace practice on Tuesday afternoon opened with the presentation of a pair of closely related papers on hot-blast stove problems, by Linn D. Bradley, H. D. Egbert and W. W. Strong of the Research Corporation, New York. The first of these papers, entitled "Dry-Hot versus Cold-Wet Blast Furnace Gas", is published in full elsewhere in this issue. The companion paper, entitled "Some Suggestions Regarding Construction of Hot Blast Stoves" appeared in the Feb. 22 issue of *The Iron Trade Review*.

Frank G. Breyer, New Jersey Zinc Co., Palmerton, Pa., in contributing to the discussion of these papers, reviewed the advantages of the automatic bag house, which, he said, "offers the final solution of the blast furnace gas cleaning problem". He pointed out that bag filters have been found to be "practically 100 per cent efficient" in removing zinc oxide from gases. Mr. Breyer also compared the automatic bag house with the electrical precipitation method of cleaning blast furnace gas. He said that with bag filters it is possible to reclaim the gas at temperatures ranging from 350 to 400 degrees Fahr. At higher temperatures, up to 500 degrees, the bags deteriorate rapidly. Prof. Joseph W. Richards, Lehigh University, South Bethlehem, Pa., suggested the substitution of asbestos for muslin as a filtering material in order to handle high-temperature gases satisfactorily. Mr. Breyer said in reply that although asbestos bags last six months, their first cost, usually, is too high. "It is simply a question," he added, "of balancing the value of the heat saved against the cost of the bags." Another speaker pointed out that cloth bags treated with a fire-resistant compound have been successfully used in England.

Referring to electrical precipitation systems, L. E. Riddle asked if any method had been devised to overcome the clogging of the precipitation chambers when handling dirty gases. H. D. Egbert, speaking for the authors of the papers under discussion, said that electrical systems are now operating satisfactorily.

The advantages of the Theissen washer were also brought out in the discussion. One speaker explained that this machine reduces the dirt in his gas to 0.02 grain per cubic foot, without the necessity of giving the gas any preliminary treatment except cooling. In this connection, it was pointed out that some of the difficulties encountered in burning cold-wet gas in stoves arise from the unfamiliarity of stove operators with its behavior in the combustion chamber. The tendency is to crowd in too much gas, for the temperature of the combustion is naturally lower than with highly preheated fuel.

R. J. Wysor, superintendent blast furnaces Bethlehem Steel Co., South Bethlehem, Pa., presented an exceedingly interesting paper on the recovery of potash as a by-product from the blast furnace. This paper was published in two installments in the Jan. 18 and 25 issues of *The Iron Trade Review*. John S. Unger, manager central research bureau, Carnegie Steel Co., Pittsburgh, reported on the results of tests made by the Carnegie company to determine the amount of available potash in slags, in flue dust and in the residues in

stoves, stacks, gas mains, open hearth regenerator chambers, etc. In the main, the results indicate that not enough potash is recoverable from the lake ore and Connellsville coke furnace burdens used in the Pittsburgh district to justify the effort involved. In the last passes of the stoves, Dr. Unger discovered deposits containing 1¼ per cent potash, of which only a third was water soluble. It is evident also that the potash is carried a long way through the gas handling system, since large percentages were found in the deposits on the gas engine pistons. The Carnegie company is now studying the potash recovery possibilities of ferro-silicon and ferro-manganese furnaces. L. E. Riddle stated that manganese ores contain twice as much water-soluble potash as ordinary iron ores, nevertheless, in certain investigations, he had detected only 0.2 to 0.3 per cent potash in manganese flue dust. Frank G. Breyer,, New Jersey Zinc Co., said that the anthracite coal slates of Pennsylvania, that are now wasted, might be valuable as a source of potash, and he suggested the operation of a blast furnace for the reduction of these slates with the sole purpose of obtaining potash, without making any pig iron. Other speakers pointed out the disadvantages of this plan. A preprinted discussion was offered by Charles H. Rich, Conshohocken, Pa.

As an interlude, W. R. Walker, electric furnace department, United States Steel Corporation, New York, exhibited photographs, of the 30-ton electric furnace that was placed in operation at the Duquesne works of the Carnegie Steel Co. on Nov. 15, 1916. He also showed a preliminary drawing of the triplexing plant under construction at the South works of the Illinois Steel Co., Chicago. This plant will include bessemer converters, large open hearth furnaces and 30-ton electric furnaces. The session on blast furnace practice was concluded by the presentation of a paper entitled "Calculations with Reference to the Use of Carbon in Modern American Blast Furnaces", by H. P. Howland, superintendent blast furnaces, Wisconsin Steel Co., South Chicago, Ill.

American Efficiency

The outstanding feature of the annual dinner of the American Institute of Mining Engineers was the address of Herbert C. Hoover of the American Commission for Belgian Relief. Mr. Hoover rapidly recapitulated the results of the work of the past two and a half years and stated that a handful of American engineers have accomplished what an army of over two millions has failed to do — effect a conquest of the Belgian people. As a result of the work in Belgium, Europeans have a much more wholesome respect for American efficiency and ability to do things. As a measure of this efficiency, Mr. Hoover said the overhead expenses of the relief work have been less than 1 per cent.

The Manufacture of Iron and Steel

THE Wednesday morning session on the manufacture of iron and steel, followed by the afternoon session on metallography and heat treatment, was characterized by the attendance of a large number of practical steel-works executives, who participated freely in the discussions. The meeting was opened by the reading of Dr. Richard Moldenke's paper on the seasoning of castings. This paper was published in the Feb. 22 issue of *The Iron Trade Review*. The principal discussion was contributed by Alexander Outerbridge Jr., William Sellers & Co., Philadelphia, covering the effect of repeated heat treatment on the size of gray iron castings. Mr. Outerbridge exhibited two cast iron test bars that had been made in 1904. Originally they were both 1 x 1 x 14 13/16 inches. As a result of 40 successive heatings to 1,550 degrees Fahr., however, one of the bars had been caused to grow or expand to 1⅛ x 1⅛ x 16½ inches, an increase in volume of 40.98 per cent, without changing the metallic properties or apparent density. Tests, however, show that the expanded bar has a specific gravity of 5.7 and the unexpanded bar a gravity of 7.25. In the course of the discussion, Mr. Outerbridge treated his audience to many interesting reminiscences, including a brief history of the development of the chilled-iron car wheel. Dr. Moldenke's paper was also later discussed by Leonard Waldo, consulting engineer, New York.

"The Significance of Manganese in American Steel Metallurgy", is the title of a paper read by F. H. Willcox, metallurgical engineer, United States Bureau of mines, Pittsburgh. After discussing the functions of the common deoxidizers, including manganese, aluminum, titanium and silicon, Mr. Willcox suggests that "the manufacturers of the country accumulate a sufficient reserve of high-grade manganese ore to tide the steel industry over at least a year's stoppage in supply. The amount of capital that would be tied up by the investment in such a tonnage of ores at the present prices and scarcity of freight-carrying bottoms is the answer to this proposal at the present time, and may be a deterring factor for all time to come, because when the present war is over and peace established, the present very apparent need of some such precaution will naturally become less and less evident. The second suggestion is that an attempt be made to develop a substitute alloy which can be used in place of or, more probably, with ferro-manganese in such proportions as to conserve the manganese.

"As far as can be learned, substitute deoxidizers are not playing a part commensurate with that which they would be called upon to do in case of emergency, nor are our resources of manganese, or our means of utilizing them, sufficiently well developed to enable us to count upon them in case of need."

In discussing this paper, Donnel F. Hewett, United States geological survey, Washington, said that the United States is woefully deficient in manganese supplies. He offered a geological explanation of this phenomenon, stating that the formation of manganese deposits is closely related to processes of rock decay and weathering. Few of the available deposits in North America have undergone secondary enrichment. Mr. Hewett said there is hope of finding rich deposits in South and Central America, and mentioned shipments from Costa Rica and explorations in Porto Rico. Alexander Outerbridge Jr., Philadelphia, gave the analysis of a small shipment of manganese ore recently received from an island in the Caribbean sea. This material contained 30 per cent manganese, 20 per cent silica and 2 per cent iron.

Referring to Mr. Willcox's explanation of the function of deoxidizers, J. S. Unger, Pittsburgh, pointed out that investigations of the effects of deoxidizers are apt to give confusing results, because it is hard to tell when the material in question ceases to act as a deoxidizer and commences to impart direct qualities to the metal. In the case of manganese, for instance, amounts in excess of 5 or 6 per cent produce unusual results which are utilized in the manufacture of manganese steel castings. Dr. Unger

also referred to experiments on the substitution of magnesium for aluminum as a deoxidizer, but pointed out that the pure metal invariably causes dangerous explosions in the ladle. Cadmium, vanadium and boron alloys also are being tried out, he said, but in all cases, so far, it has been found they must be assisted by one of the common deoxidizers.

Leonard Waldo, New York, referred to the early experiments in the use of aluminum as a deoxidizer, and said that it was alloyed with iron. He suggested a similar expedient to counteract the bad effects of pure magnesium. Magnesium, he said, burns too fast in steel and the resultant vapor causes an explosion. Dr. Moldenke concurred in Mr. Waldo's suggestion. Another speaker said this simply pushes the difficulty one step farther back, on account of the trouble encountered in making a magnesium-iron alloy.

"Roll Scale as a Factor in the Bessemer Process", by A. Patton and F. N. Speller, published in the Feb. 15 issue of *The Iron Trade Review*, brought out a large amount of discussion. In presenting this paper, Mr. Speller gave out some additional data covering 1916 operations. The actual conversion and cupola losses at the National works, McKeesport, Pa., in 1916, he said, were 8.95 per cent; theoretical losses were 8.98 per cent.

A. K. McClarey, assistant general superintendent, Youngstown Sheet & Tube Co., Youngstown, O., offered a written discussion in which he said the Youngstown company has been using roll scale since 1908 with extremely beneficial results. The output, he said, has been increased 20 per cent. C. S. Robinson, vice president, Youngstown Sheet & Tube Co., confirmed these conclusions and pointed out that the use of roll scale in the bessemer process enables the blast furnaceman to make more pig iron and produce it more economically. Mr. Robinson also offered the facilities of the Youngstown company for an investigation of the roll-scale process from a thermal standpoint, in order to work out a satisfactory heat balance.

"Temperature Measurements in Bessemer and Open Hearth Practice", is the title of a paper read by Dr. George K. Burgess, chief division of metallurgy, United States bureau of standards, Washington. In response to an inquiry by Joseph W. Richards, South Bethlehem, Pa., Dr. Burgess pointed out that one of the prime advantages of the optical pyrometer lies in the fact that the observer can work in a place of safety. The Wednesday morning session was concluded by a paper on the manufacture of weldless steel tires for locomotive and car wheels by Guillaem Aertsen, assistant to vice president, Midvale Steel Co., Philadelphia. This paper will be published in a subsequent issue of *The Iron Trade Review*.

Metallography, Mining and Miscellaneous Papers

TWO sessions were held on metallography and the heat treatment of steel at which papers of both practical and scientific interest were read. Henry Fay's paper on the erosion of guns, published in *The Iron Trade Review*, Dec. 14, 1916, attracted a large share of attention. In a written discussion, Rear Admiral Ralph Earl, chief of ordnance, pointed out that the rifling of large guns first hardens, then cracks and finally wears away. The heat cracks, he said, are not a serious menace to the strength of the gun. Erosion, he added, in the opinion of the navy department, is not due to excess carbon causing a reduction in the melting point of the metal. The department recognizes two kinds of erosion, that resulting from the escape of gas around the projectile and that caused by the rush of gas behind the projectile.

A. E. Bellis, metallurgist, New England Westinghouse Co., Springfield, Mass., and T. W. Hardy, metallurgist, Nova Scotia Steel & Coal Co., New Glasgow, N. S., offered a paper on the heat treatment of high speed tools, portions of which will be published in a later issue of *The Iron Trade Review*. Considerable written discussion was presented with this paper. In a discussion by Robert J. Anderson, *The Iron Trade Review*, Cleveland, it is stated that:

"The question of employing correct hardening temperatures is one that is sadly neglected, particularly in many large plants that forge and treat their machine tools for private use. An instance came to my attention some time ago," Mr. Anderson continues, "in connection with some work with the standardization of high speed steels for machine tools, where there were no less than six different brands of alloy steels being used for machine tools such as lathe, shaper, planer, boring mill and cutters of like nature. All of these different steels received identical heat and forging treatment—or at least that was the aim of the tool hardener. It would seem that at the present price of alloy steels the subject should receive a closer scrutiny by purchasers. One not familiar with the workings of some plants that disdain to lend an ear to scientific heat treatment would scarcely give credence to some of the methods employed, not only in the treatment of the steel but also in its selection and purchase."

"The Effect of Sulphur on Low Carbon Steel," by Carle R. Hayward, was published in the Oct. 12 issue of *The Iron Trade Review*. "A Method of Distinguishing Sulphides from Oxides in the Metallography of Steel," by George F. Comstock, appeared in the Dec. 14 issue. "Grain Growth Phenomena in Metals," by Zay Jeffries, was published Jan. 25, and "On Grain Growth," by Prof. Henry M. Howe, appeared Feb. 8, together with "The Function of Alumina in Slags", by Carl Henrich.

Interesting written discussion accompanied a paper by E. C. Harder, Madison, Wis., entitled, "Manganese Ores of Russia, India, Brazil and Chile."

"I do not think," said Herbert K. Scott, London, "that the Brazilian government will assist the iron ore export business to the exclusion of the establishment of steel manufacture in the country, even though as yet no coal suitable for coke manufacture has been found in Brazil. The old rule that ore should be taken to fuel rather than the reverse is not now strictly applied anywhere—for have not iron works been constructed at Duluth to utilize empty lake ore boats as fuel carriers, and further, has not the Gary plant been constructed between the ore and fuel, following the industrial centers moving west?"

"Recent Geologic Developments on the Mesabi Iron Range, Minnesota," is the subject of an interesting paper read by J. F. Wolff, mining engineer, Duluth, Minn. In a written discussion of this paper, Edwin J. Collins, mining engineer, Duluth, says that:

(*Concluded on page* 541)

Naval Facts

It has been fashionable recently to emphasize our lack of naval preparedness by giving credence to stories to the effect that our high-power battle-ship guns are worn out and unfit for battle. It is refreshing to find direct refutation of these statements in an official communication from a naval officer, presented at the New York meeting of the American Institute of Mining Engineers. Many of the largest guns, he says, have been fired 1.6 times the theoretical maximum number of rounds with no diminution in range or acuracy. This proves that American metallurgy need offer no apologies to any other nation.

Graphic Record of Shipments by Ranges for the Past 27 Years

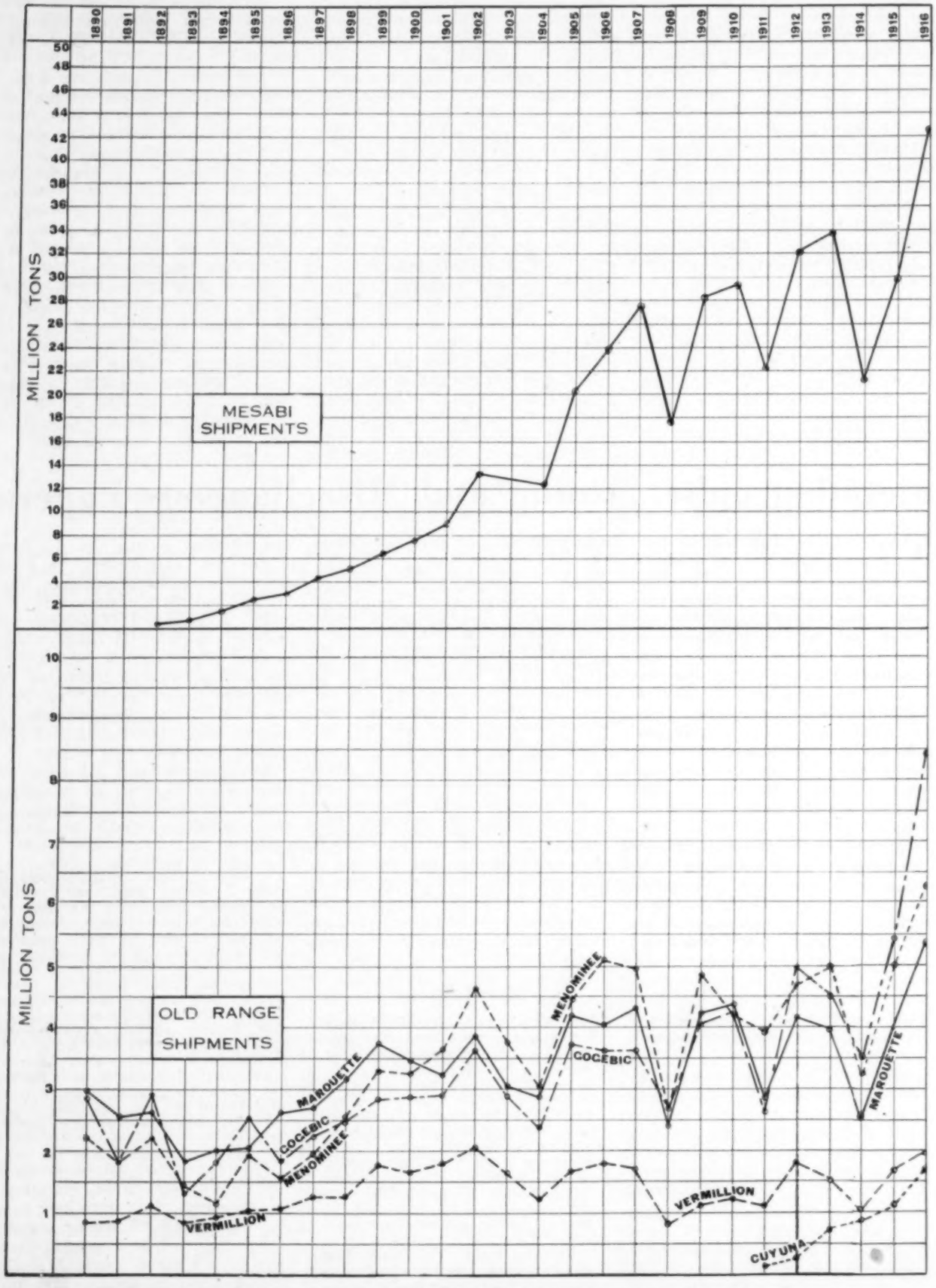


CHART SHOWING SHIPMENTS OF IRON ORE FROM MESABI RANGE, 1892-1916; OTHER RANGES, 1890-1916

1916 Lake Superior Ore Shipments

All-Rail Movement of 1,924,268 Tons Carries Season's Total to 66,658,466 Tons—Official Figures Showing Tonnage Forwarded by Each Mine and by Ranges Last Year

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BY R. V. SAWHILL

AN all-rail movement of 1,924,268 tons brought the iron ore shipments from the Lake Superior district in 1916 to 66,658,466 tons. This total has just been determined by the official figures compiled by *The Iron Trade Review*. The 1916 shipments showed a gain of 19,385,715 tons over 1915, when 47,272,751 tons were forwarded. This increase was 41.01 per cent of the total movement during 1915, which year in turn had shown a gain of 44.43 per cent of the 1914 movement.

The lake movement in 1916 was 64,734,198 tons, compared with 46,318,804 tons in 1915, a gain of 18,415,394 tons. The all-rail shipments of 1,924,268 tons compared with a rail movement of 953,947 tons in 1915, a gain of 970,321 tons, or more than 100 per cent. The all-rail movement was by far the largest of any year in the history of the district. The record of all-rail shipments since 1906 is as follows:

	Gross tons.		Gross tons.
1916	1,924,268	1911	662,719
1915	953,947	1910	813,639
1914	707,829	1909	903,270
1913	876,638	1908	587,893
1912	785,769	1907	975,959

Shipments from the Lake Superior district by independent companies again exceeded those of the United States Steel Corporation. In 1916, the independents forwarded 52.48 per cent of the total tonnage, compared with 52.37 per cent in 1915. The 1915 record had been the highest since the formation of the Steel Corporation. Last year was the fifth successive year in which the independent companies have moved more than one-half of the ore shipped from the Lake Superior district. In 1914, the independents shipped 50.99 per cent of the total, compared with 50.94 in 1913 and 50.54 in 1912. In one other year since 1905 have the independents shipped the majority of the tonnage, that being 1910, when their percentage was 50.14. The percentage in 1906 was 47; 1907 and 1908, 44; 1909, 49.64, and 1911, 47.30. The strength of the independent ore interests is clearly revealed by their record of having forwarded more than one-half of the season's tonnage in six of the last seven years.

The following table shows the shipments and percentage of the Oliver Iron Mining Co., the Steel Corporation's mining organization, for each of the last 10 years:

Year.	Gross tons.	Percentage.
1916	31,673,131	47.52
1915	22,518,613	47.63
1914	16,039,654	49.01
1913	24,502,244	49.06
1912	23,845,363	49.46
1911	17,282,499	52.70
1910	21,661,143	49.86
1909	21,397,866	50.36
1908	14,123,957	56.00
1907	22,710,898	56.00
Total	215,755,368	49.95

Shipments from the Mesabi range in 1916 were 42,525,612 tons, against 29,756,689 tons in 1915, a gain of 12,768,923 tons. Its percentage of the total shipments was 63.80, against 62.95 in 1915; 65.62 in 1914; 68.15 in 1913; and 66.46 in 1912. The Gogebic range again ranked as the second largest shipper, forwarding 8,489,685 tons, against 5,477,767 tons in 1915, a gain of 3,011,918 tons. Its percentage in 1916 was 12.74, against 11.59 in 1915; 10.90 in 1914; 9.07 in 1913; and 10.38 in 1912. The Menominee range also showed a large increase in the tonnage forwarded, its shipments for 1916 being 6,364,363 tons, compared with 4,982,626 tons in 1915, a gain of 1,381,737 tons. Its percentage was 9.55, against 10.54 in 1915; 9.83 in 1914; 9.94 in 1913; and 9.77 in 1912. The Marquette range did not show as great a gain in 1916 as in the previous year, 1916 shipments being 5,396,007 tons, against 4,105,378 tons in 1915, a gain of 1,290,629 tons. Its percentage was 8.09 in 1916, against 8.68 in 1915; 7.61 in 1914; 7.94 in 1913; and 8.71 in 1912. Vermillion range shipments were 1,947,200 tons against 1,733,595 tons in 1915, a gain of 213,605 tons. Its percentage was 2.92, against 3.67 in 1915; 3.10 in 1914; 3.14 in 1913; and 3.83 in 1912.

All ranges, with the exception of the Vermillion, set new records last year in the tonnage of ore shipped. The record of 8,489,685 tons made by the Gogebic greatly exceeded its previous record set in 1915 with 5,477,767 tons. The greatest tonnage ever forwarded from the Menominee, prior to last year, was in 1906, when 5,109,088 tons were shipped. In 1916, the Menominee shipped 6,364,363 tons. The Marquette shipments for 1916 greatly exceeded the record year of 1910, last year's total being 5,396,007 tons, compared with 4,392,726 tons in 1910. The Vermillion's 1916 total was the highest with the exception of 1902, when 2,084,263 tons were forwarded.

Shipments from the Cuyuna range continue to increase. The total tonnage forwarded from the newest range last year was 1,716,218 tons, compared with 1,136,113 tons in 1915, a gain of 580,105 tons. The Cuyuna's percentage of the total shipments for 1916 was 2.57, a slight increase over the 1915 percentage of 2.40. In 1914, the Cuyuna's percentage was 2.62; in 1913, 1.47, and in 1912, 0.63.

Twelve mines shipped more than one million tons last year, these mines being the Burt, Canisteo, Fayal, Hull-Rust, Leonidas, Mahoning, Morris and Sellers on the Mesabi; Newport, Norrie Group and Wakefield on the Gogebic, and Cleveland-Cliffs Group on the Marquette. In 1915 there were seven mines which reached this figure, they being the Burt, Canisteo, Hull-Rust, Mahoning, Morris and Sauntry-Alpena on the Mesabi and the Norrie Group on the Gogebic.

Comparative Shipments by Ranges, 1916-1915

	1916.	1915.	Increase.
Mesabi	42,525,612	29,756,689	12,768,923
Menominee	6,364,363	4,982,626	1,381,737
Gogebic	8,489,685	5,477,767	3,011,918
Marquette	5,396,007	4,105,378	1,290,629
Vermillion	1,947,200	1,733,595	213,605
Cuyuna	1,716,218	1,136,113	580,105
Mayville and Baraboo	219,381	80,583	138,798
Totals	66,658,466	47,272,751	19,385,715
By lake	64,734,198	46,318,804	18,415,394
By rail	1,924,268	953,947	970,321

Official Record of Shipments from Lake Superior District in 1916 and 1915, Gross Tons

MESABI RANGE

	1916.	1915.		1916.	1915.		1916.	1915.		1916.	1915.
Adams	961,500	902,372	Glen	284,889	253,398	Leonard-Glen		66,327	Scranton		18,698
Adriatic	220,818	33,625	Grace	81,289	70,783	Leonidas	1,147,105	732,777	Sellers	1,344,121	721,908
Agnew	102,150		Graham	228,406	357,545	Lincoln	286,128	239,142	Shenango	979,658	939,674
Albany	468,291	317,030	Grant	110,604	189,749	Lone Jack	61,994	21,560	Shiras	172,518	50,707
Bangor	223,576	294,346	Hanna	124,021	27,395	Mace	470,794	120,906	Sliver	156,638	252,347
Belgrade	180,532	241,525	Harold	216,567	86,340	Mahoning	2,215,788	2,311,940	Spruce	463,179	638,230
Bennett	672,572	50,475	Harrison	32,876	239,075	Malta	66,573		St. James	36,066	
Bessemer		49,459	Hawkins	602,760	327,749	Meadow	50,763	41,182	Stevenson	349,960	8,585
Biwabik	428,944	385,389	Helmer	395,615	101,799	Midway		1,106	Sullivan		20,048
Brunt	162,290	11,805	Higgins	162,216		Miller	252,404	247,188	Susquehanna	764,249	618,488
Burt	1,060,487	1,043,607	Higgins No. 1		219	Minnewas	11,027	33,478	Thorne	81,692	18,235
Canisteo	1,943,745	1,622,182	Hill	552,104	998,649	Minorca		116,591	Tioga	4,275	
Cavour	134,632		Holland	29,448		Missabe Mt	539,913	668,060	Troy	6,631	
Chester	73,401	6,150	Holman	610,281	845,898	Mohawk	185,313	69,318	Union	241,991	247,504
Chisholm	263,820	468,680	Hudson	110,510	196,952	Monica		77,946	Uno North	70,588	
Clark	251,226	439,461	Hull-Rust	7,665,611	2,294,405	Morris	1,609,971	1,167,421	Uno South		21,557
Commodore	579,285	561,438	Itasca	275,108	126,003	Morton	44,940	58,214	Utica	326,360	358,652
Corsica	292,228	160,655	Jean	3,927		Myers	58,898	216,129	Victoria	71,614	
Crosby	110,652		Judd	50,263	334,685	Norman	320,937	250,695	Vivian		49,456
Cyprus	15,913	25,566	Kerr	539,675		North Eddy	104,710	2,659	Wacootah	101,970	55,645
Dale	29,971	116,336	Kevin	265,868		No. Harrison	422,825	169,948	Wanless	141,726	49,212
Deacon	98,634	59,925	Kinney	465,263	471,522	Ohio	23,665		Webb	140,279	
Dean	687,878	360,372	Knox	70,235		Ordean	395,591		Weed	113,447	73,670
Duncan	5,198	5,152	La Belle	14,765		Perkins	79,281		Wentworth		851
Eddy	11,782	16,889	Langdon & Warren 40	47,481		Pettit	178,917	158,397	White Iron		2,448
Elba	130,384	225,453				Philbin	110,922	9,842	Whiteside		31
Fayal	2,288,799	774,096	La Rue	253,402	24,911	Prindle	10,995	24,100	Winifred	69,765	41,489
Fowler	29,711		Laura	188,569	132,081	Quinn	226,360	91,007	Woodbridge	279,284	177,196
Franklin	54,002	81,126	Leetonia	656,876	607,447	Ruddy	57,300	50,003			
Genoa	274,172	426,329	Leonard	316,468	197,599	Sauntry-Alpena	933,937	1,455,825			
Gilbert	70,187		Leonard-Burt	482,580	324,759	Schley	78,093	101,891	Total	42,525,612	29,756,689

MENOMINEE RANGE

	1916.	1915.		1916.	1915.		1916.	1915.		1916.	1915.
Amasa-Porter	80,492		Chatham	188,808	132,779	Hiawatha	187,070	93,455	Ravenna	3,476	116,724
Antoine (Clifford)	113,101		Chicagon	100,640	155,711	Homer	161,286	103,546	Richards	29,382	92,808
Aragon	244,478	302,275	Commonwealth (Buckeye)	81,479	13,152	Indiana	44,162	52,570	Riverton Group	174,992	262,382
Baker		41,378	Cottrell	75,089	45	James	167,115	121,655	Rogers	81,842	53,158
Balkan	229,195	144,284	Davidson	164,248	152,430	Judson	162,519		Tobin	146,113	18,624
Baltic	110,965	10,078	Dunn		8,304	Kimball		19,533	Tully	236,302	242,049
Bates	73,188	45,171	Ernst	74,879	124,765	Loretto	174,173	68,806	Virgil	36,307	
Bengal	140,961	39,615	Florence	28,240	23,118	Michigan	28,483	112,680	Warner	33,751	
Berkshire	38,467	15,413	Fogarty	89,506	27,718	Monongahela	21,922		Wickwire	13,265	
Bristol (Claire)	462,559	378,786	Forbes	121,010	99,050	Munro	17,621		Youngs	53,691	
Carpenter	240,114	284,088	Genesee (Ethel)		1,184	Odgers	53,177		Zimmerman	145,716	108,217
Caspian	448,631	479,084	Gt. Western		35,759	Penn Iron Mining Co.	427,266	411,393			
Chapin	557,485	384,654	Hemlock	72	28,172	Pewabic	301,125	178,013	Total	6,364,363	4,982,626

MARQUETTE RANGE

	1916.	1915.		1916.	1915.		1916.	1915.		1916.	1915.
Adams (Amer. Min. Co.)	7,820	800	Cleve. Cliffs Group	1,036,775	634,837	Lloyd	281,502	195,975	Queen Group	283,775	473,961
American (Sterling)	245,969	87,514	Empire	47,110		Maas	267,946	267,190	Republic	209,060	215,182
Austin	64,521		Gwynn	143,708	57,910	Mary Charlotte	228,374	203,922	Richmond	181,154	177,000
Beaufort (O.)	40,009	21,139	Holmes	3,379	17,373	Milwaukee Davis		6,572	Rolling Mill	253,943	130,902
Breitung (Hematite)	153,607	152,063	Iron Mt. Lake	5,893	10,807	Morris	58,101	80,546	Stegmiller	65,420	40,248
Cambria	195,612	159,443	Isabella	134,938		Negaunee	523,736	480,521	Stephenson	355,166	243,458
Chase	72,345	39,059	Jackson		56,026	Portland		97,476	Volunteer	106,988	18,850
			Lake Angeline		19,513	Princeton			Washington	6,631	
			Lake Superior	422,525	199,920	(Swanzey)		17,171	Total	5,396,007	4,105,378

GOGEBIC RANGE

	1916.	1915.		1916.	1915.		1916.	1915.		1916.	1915.
Anvil		2,804	Davis (Wisconsin)	4,997	5,434	Newport	1,315,980	838,875	Royal	11,527	8,004
Ashland	82,715	112,932	Eureka	207,959	128,414	Norrie Group	1,855,863	1,408,516	So. Chicago		1,274
Asteroid	89,876	13,468	Geneva	86,922	34,416	No. Newport	48,070	32,356	Sunday Lake	188,771	136,211
Brotherton	107,813	107,244	Ironton	148,191		Ottawa (Odanah)	309,554	196,486	Tilden	110,733	99,516
Cary	308,834	203,819	Keweenaw	121,014	42,367	Palms	529,751	442,422	Wakefield	1,061,730	651,302
Castile	133,162	76,702	Mikado	23,741	1,044	Plymouth	330,427		Yale (West Colby)	149,155	42,632
Chicago		30,977	Montreal	530,813	464,272	Puritan	308,534	80,367	Total	8,489,685	5,477,767
Colby	423,553	315,913									

VERMILLION RANGE

	1916.	1915.		1916.	1915.
Chandler	311,793	104,628	Sibley	237,258	129,565
Consolidated Vermillion	1,436		Soudan	142,688	77,636
Pioneer	507,086	453,099	Zenith	482,783	714,852
Savoy	38,067	76,672			
Section 30	226,089	177,143	Total	1,947,200	1,733,595

MAYVILLE-BARABOO RANGES

	1916.	1915.		1916.	1915.
Cahoon	87,802		Mayville	125,970	80,583
Illinois	5,609		Total	219,381	80,583

CUYUNA RANGE

	1916.	1915.		1916.	1915.
Armour No. 1	77,034	79,538	Kennedy	166,915	216,655
Armour No. 2	341,147	303,280	Mahnomen	146,602	
Croft	68,867		Mangan	32,836	
Cuyuna Mille-Lacs	90,564	36,847	Meacham	25,207	
Cuyuna-Sultana	35,169		Pennington	206,085	117,068
Ferro	14,501		Rowe	180,239	137,598
Hill Crest	19,431		State Lease	331	
*Hoch	24,035	8,201	Thompson	185,032	202,227
Ironton	51,769	316	Wilcox	50,454	34,383
*Formerly Iron Mountan.			Total	1,716,218	1,136,113

	1916	1915
GRAND TOTAL	66,658,466	47,272,751

In 1914 only four mines shipped more than one million tons, they being the Leonard, Mahoning, Sauntry-Alpena and Canisteo, all on the Mesabi. In 1913, 11 mines reached the 7-figure mark in shipments, they being the Adams, Canisteo, Fayal, Genoa, Hull-Rust, Leonard, Mahoning, Sauntry-Alpena and Uno South on the Mesabi and the Norrie Group and Newport on the Gogebic. Eleven mines also reached that figure in 1912, they being the Canisteo, Dale, Genoa, Hill, Hull-Rust, Leonard, Mahoning, Sauntry-Alpena and Uno South on the Mesabi, the Norrie Group on the Gogebic and the Cleveland-Cliffs Group on the Marquette. The mines which shipped more than a million tons in 1911 were Canisteo, Dale, Hill, Leonard, Mahoning and Sauntry-Alpena, all on the Mesabi.

The wonderful Hull-Rust mine was the leading shipper last year, forwarding the immense total of 7,665,611 tons, or more than the shipments from any of the ranges, excepting the Mesabi and Gogebic. The previous record made by this mine was in 1913 with shipments of 3,457,608 tons. Two other mines shipped over two million tons, the Fayal, with 2,288,799 tons and the Mahoning with 2,215,788 tons. The Mahoning was the leading shipper in 1915, with 2,311,940 tons. The Hull-Rust has been the leading shipper in seven of the last 10 years, the Hill leading in 1911. The following new mines shipped in 1916:

On the Mesabi: Jean, of the Kingston Mining Co.; Kerr and Ordean, of the Oliver Iron Mining Co.; Kevin, of Butler Bros.; Langdon & Warren 40, of the Arthur Iron Mining Co.; St. James, of Corrigan, McKinney & Co.; and Tioga, of the Shenango Furnace Co.

On the Menominee: Amasa-Porter, of the Judson Mining Co.; Odgers, of Corrigan, McKinney & Co.; Warner, of Pickands, Mather & Co.

On the Cuyuna: Croft, of the Merrimac Mining Co.; Cuyuna-Sultana, of the Cuyuna-Sultana Iron Co.; Ferro, of the Onahman Mining Co.; Hill Crest, of the Hill Mines Co.; Mahnomen, of the Mahnomen Mining Co.; Mangan, of the Mangan Iron & Steel Co.; Meacham, of the Rogers, Brown Ore Co.; State Lease, of the Inland Steel Co.

On the Gogebic: Plymouth, of Coates & Tweed.

On the Marquette: Isabella, of the Cascade Mining Co.

On the Vermillion: Consolidated Vermillion, of the Consolidated Vermillion & Extension Co.

On the Mayville-Baraboo: Cahoon, of the Donner Steel Co.

The total of 22 new shippers in 1916 is the same as the total in 1915. In 1914 16 new mines were opened; 20 in 1913; 13 in 1912; and 12 in 1911. Seven of the new mines shipping last year are located on the Mesabi, three on the Menominee, eight on the Cuyuna and one each on the Gogebic, Marquette, Vermillion and Mayville-Baraboo. Shipments from the new mines totaled 2,357,850 tons in 1916, compared with 1,203,213 tons in 1915; 677,182 tons in 1914; 831,567 tons in 1913; 361,904 tons in 1912 and 1,769,423 tons in 1911.

Several mines which had been idle for years shipped ore in 1916. The Monongahela mine on the Menominee range which had not made a shipment since 1903, again returned to the active list. The Higgins and Victoria mines, which had not forwarded ore since 1911 again shipped in 1916, and the Illinois, on the Mayville-Baraboo range, idle since 1908, also was among the shippers last year.

Shipments from Canadian mines in 1916 were as follows: Helen, of the Algoma Steel Corporation, 37,272 tons; Magpie, of the Algoma Steel Corporation, 187,809 tons; Moose Mountain, of Oglebay, Norton & Co., 5,338 tons. The Helen shipped 220,771 tons in 1915; 80,860 tons in 1914; 42,550 tons in 1913; 48,838 tons in 1912; and 128,628 tons in 1911. The Moose Mountain shipped 40,444 tons in 1915; 29,457 tons in 1914; 102,238 tons in 1913; 39,061 tons in 1912; and 6,678 tons in 1911. The Magpie shipped 107,560 tons in 1915; 98,070 tons in 1914 and 19,934 tons in 1913. The shipments for the Canadian mines are not included in the total for Lake Superior ore shipments.

In 1916, 233 mines shipped, compared with 209 mines in 1915; 196 in 1914; 223 in 1913; 194 in 1912, and 184 in 1911. Of those shipping last year, the Mesabi had 107, Menominee 45, Marquette 27, Gogebic 25, Cuyuna 18, Vermillion 8 and Mayville-Baraboo 3. In 1915, the Mesabi shippers numbered 97, Menominee 40, Marquette 28, Gogebic 26, Cuyuna 10, Vermillion 7, and Mayville-Baraboo 1.

The following table shows the average shipments of all of the mines on the six leading ranges and of the whole Lake Superior district for 1916 and 1915, in gross tons:

AVERAGE MINE SHIPMENTS.

	1916.	1915.
Mesabi	397,436	306,769
Gogebic	339,585	210,683
Vermillion	243,400	247,656
Marquette	119,852	146,621
Menominee	141,430	124,566
Cuyuna	95,345	113,611
Lake Superior district	286,087	226,186

The Bossert Corporation has taken out a New York charter with a capital of $1,100,000 with Gay H. Brown, Daniel E. Meegan and Geo. A. Kernan, all of Utica, as directors. The company will manufacture iron and steel products and do sheet metal stamping. The main office and plant are to be at Frankfort, Herkimer county, N. Y.

The Stroh Steel-Hardening Process Co., Pittsburgh, has appointed F. Lloyd Mark western sales manager, with offices at 728 Monadnock block, Chicago.

Large Ore Chart

A chart 26 x 30 inches has been published by The Iron Trade Review which shows annual shipments of each mine since 1897, a period of 20 years, together with the grand total for every mine since the opening of the district. The chart is similar to those issued annually by The Iron Trade Review prior to 1912, but is larger, more complete and more legible. The chart can be secured from The Iron Trade Review, Penton building, Cleveland, for $1.

Shipments by Ports and All-Rail, Gross Tons

	1916.	1915.	1914.	1913.	1912.	1911.
Escanaba	7,457,444	5,649,289	3,664,451	5,399,444	5,234,655	4,278,445
Marquette	3,858,092	3,099,589	1,755,726	3,137,617	3,296,761	2,200,380
Ashland	8,057,814	5,146,772	3,363,419	4,338,230	4,797,101	2,429,290
Two Harbors	10,735,853	8,642,942	5,610,262	10,075,718	9,370,969	6,367,537
Superior	12,787,046	8,342,793	11,309,748	13,788,343	14,240,714	9,920,490
Duluth	21,837,949	15,437,419	6,318,291	12,331,126	10,495,577	6,934,269
Total by lake	64,734,198	46,318,804	32,021,897	49,070,478	47,435,777	32,130,411
Total by rail	1,924,268	953,947	707,829	876,638	785,769	662,719
Total	66,658,466	47,272,751	32,729,726	49,947,116	48,221,546	32,793,130

Shipments by Ranges, Gross Tons

	1916.	1915.	1914.	1913.	1912.	1911.
Marquette	5,396,007	4,105,378	2,491,857	3,966,680	4,202,308	2,833,116
Menominee	6,364,363	4,982,626	3,221,258	4,965,604	4,711,440	3,911,174
Gogebic	8,489,685	5,477,767	3,568,482	4,531,558	5,006,266	2,603,318
Vermillion	1,947,200	1,733,595	1,016,993	1,566,600	1,844,981	1,088,930
Mesabi	42,525,612	29,756,689	21,465,967	34,038,643	32,047,409	22,093,532
Cuyuna	1,716,218	1,136,113	859,404	733,021	305,111	147,431
Mayville and Baraboo	219,381	80,583	105,765	145,010	104,031	115,629
Total	66,658,466	47,272,751	32,729,726	49,947,116	48,221,546	32,793,130

MEN OF THE IRON TRADE

Who they are Where they are What they are doing

PHILIP NORTH MOORE, St. Louis, the new president of the American Institute of Mining Engineers, is one of the few technical men whose names are found in "Who's Who." An examination of his record shows that he is a mining engineer of the old school who has carved his way to preferment by years of intimate contact with the actual work of extracting ores from the earth. As mentioned in last week's issue of *The Iron Trade Review*, he has had several years' experience in geological work and has been closely identified with gold, silver, copper, iron, zinc and lead mining operations, first as an engineer and later as an executive and manager. Mr. Moore is still active in his chosen profession and the weight of 68 years has not diminished his energy. His administration as president of the American Institute of Mining engineers is destined to be full of activity and enterprise. In recognition of his professional attainments, Mr. Moore carries the degree of master of arts and is also an honorary member of Tau Beta Pi.

Wm. L. Saunders, of New York, chairman of the Ingersoll-Rand Co., has been appointed as Class C director of the New York Federal Reserve Bank.

William Scott, British representative of the Graton & Knight Mfg. Co., Worcester, Mass., has returned from an 8-month trip to Great Britain.

W. S. Ottinger Jr., formerly with the General Export Co., Philadelphia, now is associated with the Smythfield Export Co., 1216-1220 Arch street, Philadelphia.

Donald Drysdale, Westfield, Mass., sailed from New York, recently, for Chile, under a 3-year contract with the Braden Copper Co.

Maj. Joseph G. Speer, chairman of the Pittsburgh Valve Foundry & Construction Co., Pittsburgh, gave a dinner recently to 150 employes of that concern.

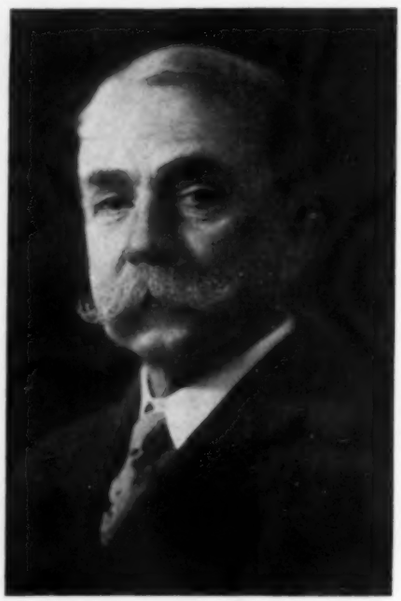
James Notestein is in charge of an office recently opened by the Cuyuna-Minneapolis Iron Co., Minneapolis, Minn., at 801 B. F. Jones building, Pittsburgh.

E. W. Pargny, president of the American Sheet & Tin Plate Co., Pittsburgh, is at Palm Beach, Fla., where he will remain until about March 10.

Arthur F. Wallbillich, for nine years master mechanic for the Bryant Electric Co., Bridgeport, Conn., has resigned his position on account of ill health.

Russell A. Cowles has purchased the interests of Arthur Curtis James and Cleveland Dodge in the Ansonia Clock Co., Ansonia, Conn., and has been elected president of the company.

W. W. Hall, who has been connected with the Republic Iron & Steel Co., Youngstown, O., for the last 18 years, has tendered his resignation and will become associated with the Columbia Steel & Shafting Co., Pittsburgh. Mr. Hall has been in charge of the Pittsburgh sales office of the Republic company for about eight years.



PHILIP NORTH MOORE

Frank Rau, who has been assistant manager of the Westfield Mfg. Co., Westfield, Mass., for several years, has resigned to go with the Buick Automobile Co., Flint, Mich.

The Railway Supply & Equipment Co., Seward, Pa., has reopened its plant, which has been shut down since early in December. W. C. Greer has been appointed foundry superintendent. The plant will employ from 75 to 80 men.

H. W. MacAroy, assistant general manager of the National Machine Co., Tiffin, O., died recently from pneumonia. Mr. MacAroy has been connected with the National Machine Co. for 30 years.

Frank L. Driver and William B. Driver, of the Driver-Harris Wire Co., Harrison, N. J., have returned from England where they attended the opening of the branch plant recently erected in that country.

G. W. Harberger, master mechanic for the Pottstown Iron Co., Pottstown, Pa., died recently. Mr. Harberger was 83 years old at the time of his death. He is survived by two daughters and a son.

The C. E. Billings Mfg. Co., Hartford, Conn., has elected the following officers for the ensuing year: Charles E. Billings, president; E. H. Stocker, secretary and treasurer; F. C. Billings, superintendent; the foregoing, F. P. Holt and W. H. Lennox, directors.

George W. Bollman, 77 years old, died recently at his home in Pittsburgh. At one time he was a member of the firm of Bollman & Garrison, Pittsburgh, whose iron foundry was located in what is now the business section of the city. At the time of his death he was associated with the Otis Elevator Co.

Investigation of the iron ore resources in the magnetic lodes of the Pacific northwest, which is being conducted by the bureau of industrial research of the University of Washington, has led to the conclusion that the presence of magnetite will warrant further exploration but that the magnetic sands are not rich enough in ore to warrant further investigation.

Samuel Chandler, recently associated with Frank D. Moffat & Co., New York City, dealers in iron and steel, now is identified with Eaton, Rhodes & Co., Cincinnati, as assistant to J. G. Walton, manager of the Pittsburgh office of that concern, 916 Oliver building, Pittsburgh. Mr. Chandler is well known in the iron trade in the east and central west. For a number of years he was connected with the sales department of the Lackawanna Steel Co.

B. E. Hutchinson has resigned his position with the Interstate Iron & Steel Co., Chicago. He was assistant to the president of the Grand Crossing Tack Co., Chicago, which was purchased recently by the Interstate company. Mr. Hutchinson has been retained in a consulting capacity by interests now contemplating the development at Clinton, Ia., of a by-product coke oven, blast furnace and steel works for the manufacture of wire products and sheets.

Iron and Money: Fact and Comment

President Leigh of Chicago Railway Equipment Co. Sounds Note of Warning Against Extravagance—Says Our Costs Now Highest in History of World

"COMMODITY prices have risen to unprecedented heights; the wages of labor have likewise advanced to figures heretofore unknown; and, while fabulous fortunes have been made in many directions, and within amazingly short periods of time, extravagance, both personal and corporate—and among employers and employes—has crept in until, as a nation, we undoubtedly are doing business at the highest cost ever known in any country at any time."

Thus President E. B. Leigh, of the Chicago Railway Equipment Co. sums up the nation's biggest economic problem, in his annual report to stockholders of that company. He points out that decline and consequent readjustment appear inevitable, once the immense war purchasing power is withdrawn, the extent of the adjustment being the unknown quantity.

"In this adjustment, the saving factor will be the replacement of the 'war' purchasing power by the great 'railway' purchasing power—when the latter is permitted to take its logical and accustomed place", says Mr. Leigh. "It is during this period of general inflation; of high prices and abnormal production, that caution should be exercised, and as nearly as possible, a sound and conservative policy adopted throughout our manufacturing industries. Surely, it is well to put one's house in order, in anticipation of whatever the future may bring."

Mr. Leigh refers to the problems which have come with the new conditions in industry, saying that among the most serious is the attitude of labor, which, he says, is fraught with many dangers and is one which we must not only clearly recognize but be prepared to face. "This is not only an economic but a sociologic problem," he says, "and one which will tax the resourcefulness and abilities of our wisest lawyers, statesmen and industrial leaders to solve."

Stock Market Awaits Developments

Pending definite signs of success or failure of the German submarine blockade, the stock market has been backing and filling, with little progress in any direction. All signs have pointed to underlying strength, however, and it is believed the market would be little disturbed even in the event of actual war. President Wilson's address to congress Monday was greeted with a general advance, although he advocated a state of armed neutrality. Money is easy, reinvestment funds are plentiful and corporate earnings are large; these are things which make for a strong market in stocks. But the public is keeping its purse strings drawn tightly until the international sky becomes less cloudy. Quotations on a number of iron, steel and industrial stocks at the close of the New York stock exchange Feb. 24 and net changes for the previous week follow:

	Feb. 23.	Feb. 16.
American Radiator	445	435
American Ship Building	62½	62
Cambria Steel	102¼	.....
Chicago Pneumatic Tool	70	67¾
LaBelle Iron Works	85	76
Lake Superior Corp'n	22⅜	17⅝
Stewart-Warner Speed. Co.	87½	87
Warwick Iron & Steel Co.	9¼	9¼
Westinghouse Air Brake	150	150
Westingh'se Elec. & Mfg. Co.	50⅜	52

Maximum quotations for a number of steel and industrial stocks, not quoted on the New York stock exchange, at the close Feb. 23 and Feb. 16, follow:

	Close Feb. 24.	Net chg.
American Can	43	— ⅞
American Can, prfd.	107⅜	— ½
American Car & Fdy.	63	— ⅜
American Car & Fdy., prfd.	116½	— ½
American Locomotive	69¾	—1½
American Locomotive, prfd.	103¼	+ ⅛
American Steel Foundries	61½	— ½
Baldwin Locomotive	52¼	—1¾
Baldwin Locomotive, prfd.	100⅞	— ⅛
Bethlehem Steel	130	+13
Colorado Fuel & Iron	46	+1
Continental Can	91¾	+ ¾
Continental Can, prfd.	111½	+1
Crucible Steel	64¾	— ⅛
Crucible Steel, prfd.	114	+3
General Electric	161¼	—3¾
Gulf States Steel	108	—8¼
Internat'l Harv. of N. J.	117½	+5¼
Inter. Harv. of N. J., prfd.	119½	+1¼
Internat'l Harv. Corp.	80	+ ⅛
Lackawanna Steel	78	—1.
Nat'l Enmlg. & Stamp. Co.	33⅛	— ⅛
Nat'l En. & Stmp. Co., prfd.	96	+ ⅞
Pressed Steel Car	77	+1½
Pressed Steel Car, prfd.	104	—1½
Pullman Palace Car	161	+ ½
Republic Iron & Steel	77	— ⅜
Republic Iron & Steel, prfd.	101½	+ ¼
U. S. C. I. P. & Fdy. Co.	18¾	—1⅜
U. S. C. I. P. & F. Co., pr.	60	+ ⅜
United States Steel	107⅛	+ ⅛
United States Steel, prfd.	118½	+ ½
Westinghouse Mfg.	49⅛	—1½

Good Year for Car Builder

The Pressed Steel Car Co. reports gross sales of $31,202,646 for 1916, compared with $17,492,621 in 1915. The balance for the common stock last year was $1,876,152, or 15.01 per cent, compared with $449,815, or 3.59 per cent, in 1915. Comparison with 1913 figures is interesting. Gross sales in that year were $30,976,360, or only $235,286 less than in 1916; yet 1916 profits were $681,336 more than those of 1913. This comparison contrasts with those of other companies whose difficulties have been featured by rising costs. The income account follows:

	1916.	1915.
Gross sales	$31,202,646	$17,492,621
Net profits	†3,051,152	1,324,815
Depreciation	300,000	.....
Prfd. divs.	875,000	875,000
Total deduc.	$1,175,000	$875,000
Balance	*1,876,152	449,815
Com. divs.	531,250	.....
Surplus	$1,344,902	$419,815
Prev. surplus	8,872,167	8,422,352
P. & L. surp.	$10,217,069	$8,872,167

*Equal to 15.01 per cent on $12,500,000 common stock, compared with 3.59 per cent earned on same stock in 1915.

†After deduction of $425,679 for repairs and renewals.

Baldwin Earns 6 Per Cent on Common

The annual report of the Baldwin Locomotive Works, just issued in pamphlet form, for the year ended Dec. 31, 1916, shows net profits equal to 7 per cent on the preferred stock and 6.1 per cent on the common stock, after liberal deductions for depreciation and plant amortization. The income account compares as follows:

	Yr. end. Dec. 31, 1916.	1915.
Gross sales	$59,219,057	$22,083,011
Cost	52,857,347	19,357,438
Manuf. profit	6,361,710	2,725,572
Oth. inc. (incl. divs. Stand. Steel Works Co.)	681,226	784,810
Eddystone bldgs.	3,462,125	.....
Total income	10,505,062	3,510,383
Ded. int. on bds., dep. accts., etc.	1,060,420	642,566
Profit	9,444,641	2,867,816
Less reserve	800,000	40,000
Deduct	†6,025,175	.....
Net profit	$2,619,565	$2,827,816
*Surp. brought forw'd.	4,865,837	3,438,021
Total undiv. prof.	7,485,302	6,265,837
Prfd. div.	1,400,000	1,400,000
Com. divs.	.....	.....
Add. cap. surp.	2,864,321	.....
Surplus	$8,949,624	$4,865,837

†Comprises $2,563,050 amortization machinery; $2,864,321 capital surplus net value. Eddystone buildings; and $597,803 capital changes, maintenance Eddystone buildings.

Business News of Nation's Capital

Customary Eleventh-Hour Jam in Congress Will Bar Passage of Many Important Bills Including the Webb Export Measure—Plans Completed for Industrial Mobilization in Case of Need

Bureau of *The Iron Trade Review*,
708 Metropolitan Bank Bldg.,

WASHINGTON, Feb. 27.—With only five legislative days of the present congress remaining, the senate finds itself jammed with important bills on which it has taken no action. It does not seem possible that some of them can be passed before adjournment. The great appropriation measures, as a matter of course, will be given precedence over all others, and it will take an "eleventh hour drive" to get these through. Administration supporters have charged that Republican senators purposely pursued tactics of delay in connection with the revenue bill in order to make an extra session of congress necessary. The President is understood to be strongly opposed to calling an extra session, desiring to have congress "off his hands" during the international crisis. Republicans have replied to these claims. They have asserted that the revenue bill is a pernicious piece of legislation, discriminatory and sectional in character. The excess profits tax, which would burden the efficiency of business corporations and partnerships, has been assailed with extreme vigor by Republican senators, who have insisted that this feature alone deserved careful attention.

Moreover, there are members of congress, who, regardless of political affiliations, feel that there ought to be an extra session so that congress can share with the President responsibility for any situation that may grow out of the international situation. Some of these members have expressed opposition to plans to confer upon the President any power he may desire to use in the event of serious developments. Others, and perhaps a majority, apparently are ready to grant him any authority he may seek. The latter take the view that an extra session should be avoided.

The makeup of the house in the next session is also a cause of apprehension to both the Republican and Democratic parties. Each party will have 215 members, leaving the so-called "balance of power" with five members of various political affiliations. Neither of the great parties therefore knows how successfully it may maneuver in the matter of legislation, although it seems evident that the administration will be considerably more handicapped in this direction that it is now.

Among the big measures not yet taken up in the senate are the army and naval appropriation bills. The former, as it passed the house, carried $247,000,000, and the latter, as amended by the senate committee on naval affairs, carries $531,000,000—by far the largest amount ever carried in any naval bill in the history of the country. The senate committee increased the appropriations by $163,000,000 over those provided in the house bill. In addition to these measures, the senate still has before it the sundry civil bill. As these three are appropriation measures every effort possible will be made to rush them through. The only alternative to this would be to pass a joint resolution continuing present appropriations, but such a plan would not be satisfactory to the administration, nor to the majority of Republican members of congress, it is believed, for they are particularly anxious that the preparedness measures at least should be passed at once. Further than this, the senate will be urged by administration supporters to act immediately on the bill giving the President power to commandeer American merchant shipping in emergencies. By some, the chances of this bill being passed are considered to be extremely doubtful. The measure is similar to the house bill, giving the President power to commandeer all American-owned ships in time of war, and empowering the shipping board to purchase in any national emergency any ship building in an American yard, whether for domestic or foreign account. It was decided not to put into the bill an authorization under which the board could purchase ships of belligerent nations when approved by the President. The bill changes the restriction on the board's power to purchase ships less than 75 per cent efficient to make it apply to ships of 50 per cent efficiency.

The Webb export bill is included in the list of important measures which it now seems will be cast aside by the senate. This bill has been so fully discussed in the house, which passed it at the first session, by the senate committee on interstate commerce and by the press that its merits are well known and therefore no debate on it would be necessary in the senate if it was only a question of getting information on the subject. But there is opposition to the bill in the senate by chronic business baiters and they are understood to be ready to bar its passage, a thing they could easily do. However, Senator Pomerene is still determined to make one last effort to have it passed.

The naval bill as amended by the senate committee has been greatly strengthened when compared with the house measure, which in itself was a strong bill. Although it carries some unnecessary provisions, such as that providing for immediate completion of the government projectile plant, on the whole, intelligent plans are proposed for expending the appropriations. The bill authorizes the President to suspend the 8-hour law in navy work; appropriates $3,000,000 for reserve material; creates a national emergency fund of $15,000,000 to secure more expeditious delivery of materials, equipment, munitions and ships already authorized. Forty coast submarines to cost $1,300,000 each, and 10 fleet submarines, to cost $1,900,000 each, are authorized in addition to the 18 submarines authorized by the house. Provision is made for a naval base at San Francisco bay, and the President in time of emergency is authorized to direct any manufacturing plant or ship yard to take up government work in preference to private work, or to take over and operate any private plant or ship yard. The building program, as proposed by the senate bill, includes three battleships, one battle cruiser, three scout cruisers, 15 destroyers, one destroyer tender, 68 submarines, and one submarine tender.

Shell Contracts Divided

Washington, Feb. 27.—Misleading reports have been published regarding contracts let by Secretary of the Navy Daniels for 14-inch armor piercing shells. These reports give the impression that the awards for the entire 14,200 projectiles involved had just been made. As a matter of fact, of this number, 4,200 were let to the

Washington Steel & Ordnance Co., some time ago, and were based on bids opened originally in August of last year, which called for 9,000 14-inch shells. Bids for the remaining 4,800 were readvertised for, and were followed by bids opened on Jan. 3, this year, for 8,100 14-inch armor piercing shells, among others, on which Hadfields, Ltd., Sheffield, Eng., put in a figure. The total number of 14-inch shells involved was thus 17,100, of which 2,900 remain to be awarded. All of the awards are based on a price of $500 each, the figure submitted by the Washington Steel & Ordnance Co. The Midvale Steel & Ordnance Co., and the Crucible Steel Co. were given 5,000 shells each.

Vocational Education Act is Signed

Washington, Feb. 27.—Both branches of congress having adopted the conference report, the vocational education bill was signed by the President last Friday.

The act provides for an expenditure of approximately $20,000,000 for the specialization of education in trades, industries and agriculture. The government is to pay half the cost of administering this system in cooperation with the states, which are to pay the other half. About $1,700,000 will be spent the first year, 1917-1918, by the government. The house and senate conferees compromised as to the manner in which the vocational board should be organized. The senate measure proposed that this board consist of cabinet members, while the house bill was more representative and provided for men chosen from the different fields of industry, agriculture, etc. The difference was adjusted by retaining the secretary of agriculture, the secretary of commerce and the secretary of labor and making the commissioner of education a member of the board. Under the senate bill the latter was not proposed as a member of the board, but under the house bill he was. In addition the conferees added three members, to be named by the President, one of whom shall be a representative of manufacturing and commerce, one a representative of labor and one a representative of agriculture. These were made members of the board by the house bill. The board, therefore, will consist of seven members, who, excepting cabinet officers, will receive an annual salary of $5,000. The senate gave up its provision that named four men, to be selected by the board, as directors, and left the broad power to the board of determining whether specialists will be needed, and, if so, to fix their salaries.

Higher Export Rates Now in Force

Washington, Feb. 27.—The increased rates on iron and steel products from the Pittsburgh district to the Atlantic seaboard for export went into effect last Saturday. The effective date was named in an order handed down by the interstate commerce commission, which vacated previous orders by which the tariffs naming the higher rates had been suspended. A few of the tariffs of western carriers which did not comply fully with the recent decision of the commission increasing the rates from the Pittsburgh district are still under suspension. In that decision it was stated that the proposed schedules would continue to be held under suspension until new tariffs were filed in accordance with the views of the commission, which insisted that Chicago, Cincinnati and other points in central freight association territory should be given rates properly adjusted to the new Pittsburgh rate, and these views have been met, except in the instances cited. In substance, the commission held that the proposed rates from Pittsburgh and related points would be allowed to go into effect, provided rates for export traffic are published from Chicago which are related to the Pittsburgh rates as 100 is to 60, and from Cincinnati which are related to the Pittsburgh rates as 87 to 60. Similar adjustment was ordered made with respect to other producing points west of Pittsburgh. The new tariffs cancel former export rates and substitute domestic rates and represent an increase of approximately 33-1/3 per cent.

To Boost Oriental Trade

Another evidence of the conviction among leaders in American business that the new interest of the country in foreign trade has come to stay is shown by the new plan of the American Asiatic Association for largely increasing its activity as a trade developer with the Far East. The association will publish a new magazine, devoted exclusively to the Orient and our relations with it, to be called *Asia*.

The association has numbered in its membership since its establishment in 1898 many of the prominent large traders with China and Japan including Eugene P. Thomas, president of the United States Steel Products Co., the export branch of the Steel Corporation; Willard Straight, vice president of the American International Corporation; Lloyd Griscom, formerly United States minister to Japan, and the president of the association; Robert H. Patchin, secretary of the National Foreign Trade Council; Charles M. Schwab, chairman of the Bethlehem Steel Corporation; Alba B. Johnson, president of the Baldwin Locomotive Works, and vice president of the association; James R. Morse, president of the American Trading Co.; H. T. S. Green, president of the International Banking Corporation; Maurice A. Oudin, foreign manager of the General Electric Co., and representatives of the Standard Oil Co., the British-American Tobacco Co., and other large concerns in the Far Eastern trade.

The new magazine is designed to present a fundamental interpretation of the life and spirit of China, Japan and the other great Oriental countries, in terms of their industrial progress. In the first issue this week a series of articles will be presented on special features of the industrial development of the Far East, including railway building in China into which American capital and engineering ability have just entered, elements in the prosperity of Japan and the new development of big American trade with the Orient.

Meeting of A. I. M. E.

(*Concluded from page* 533)

"As an engineer of the Oliver Iron Mining Co., Mr. Wolff has had access to all the mines of the Mesabi range, on which that company operates, about 40 properties. The Oliver company and the other operating companies on the range are very liberal in giving each other information of mutual interest and permitting inspection of their mines.

"The observations in his paper cover 110 or more operating properties and many others now inactive. The mines are located along about 80 miles of the present producing portion of the range. As a result of his keen observations in the mines and the study of the records of several hundred miles of drill holes, he has correlated the structural formation of all portions of the range and shows that although the detail of the different ore bodies varies, the structural features are the same.

"The engineers of all Mesabi properties should work out the structure of their respective mines following the broad classification made by the author, so that ultimately there will be a uniform detailed structural record of all the ore bodies of this great iron ore district.

"The information contained in Mr. Wolff's paper has been obtained by laborious observations and comparisons. It is of much economic value and anyone interested in mining on the Mesabi range is indebted to him for publishing the information that has taken so long to acquire."

Electric Companies Buy Lavishly

General Electric and Westinghouse Close for Heavy Requirements—Foreign Business Takes Mid-Month Spurt—Pittsburgh Dealers Have Their Hands Full —Price Advances Threaten in East and West

THE most important business from any single buyer now before the machine tool industry is that of the General Electric Co. This company during the past three weeks has placed orders for more than $1,000,000 worth of tools and the indications are that it will be in the market for some time to come, since it continues to distribute important additional orders, and to issue new inquiries almost every day. The tools which are being purchased are for installation at the company's plants at Schenectady, N. Y.; Lynn, Mass.; Erie, Pa., and the proposed new plant at Bloomfield, N. J. In addition, the General Electric Co. recently purchased a plant in Philadelphia, which, it is understood, is to be devoted to the manufacture of electrical switches, and it is believed some of the tools now being bought will be installed there.

Another interest which has been an important buyer of machine tools during the past two years, is opening negotiations for the purchase of a huge new list of tools. This is the Newport News Ship Building & Dry Dock Co., Newport News, Va., with purchasing office at 233 Broadway, New York.

The Grand Trunk railway, from its offices at Montreal, Canada, has issued inquiries on a huge list of equipment to be installed in new shops at Port Huron, Mich.; this list includes about 100 machines for miscellaneous purposes. Among other new railroad inquiries the only ones of importance are those issued by the New York Central and the Southern Pacific roads. The latter interest is inquiring for nine tools. The Sun Ship Building Co., Chester, Pa., which has figured in the market to a limited extent of late, has placed some more orders for tools and issued some additional inquiries. The Carnegie Steel Co. has put out some inquiries for punching and shearing machinery for installation in its warehouse at Baltimore. The Guerber Engineering Co., South Bethlehem, Pa., has placed some orders for punching and shearing machinery. Export demand continues to be of large proportions. Good-sized orders are coming from France, England and, to a smaller extent, from Spain, Italy and other countries. The foreign lists embrace all kinds of tools. The Interborough Rapid Transit Co., New York, is about to erect five substations, to be completed this year, and it is expected that the company will close for three cranes and other necessary equipment without delay.

Further advances in machine tool prices have materialized. One manufacturer of milling machines has advanced his quotations 10 per cent and, in selling, reserves the right to charge an additional 10 per cent in case another advance is declared before the tools are shipped.

Heavy Equipment Features Pittsburgh Market

A HEAVY demand exists for all types of machine tools and rolling mill equipment at Pittsburgh. Inquiries for delivery to domestic consumers are heavier than they have been in many months. Subsidiary companies of the United States Steel Corporation are asking appropriations for the replacement of many machines. The Carnegie Steel Co. continues to be an active buyer of equipment for its new coke works at Clairton, Pa. The Westinghouse Electric & Mfg. Co. will probably close negotiations shortly for about 200 machine tools and 50 cranes for its new plant at Essington, Pa. The International Steel Tube & Rolling Mills Co. has announced plans for erecting a tube mill at Warren, O. The Jones & Laughlin Steel Co., which has been making numerous improvements to its works at Pittsburgh, has completed plans for an additional blast furnace at its Eliza group.

Price Changes Imminent in Cleveland

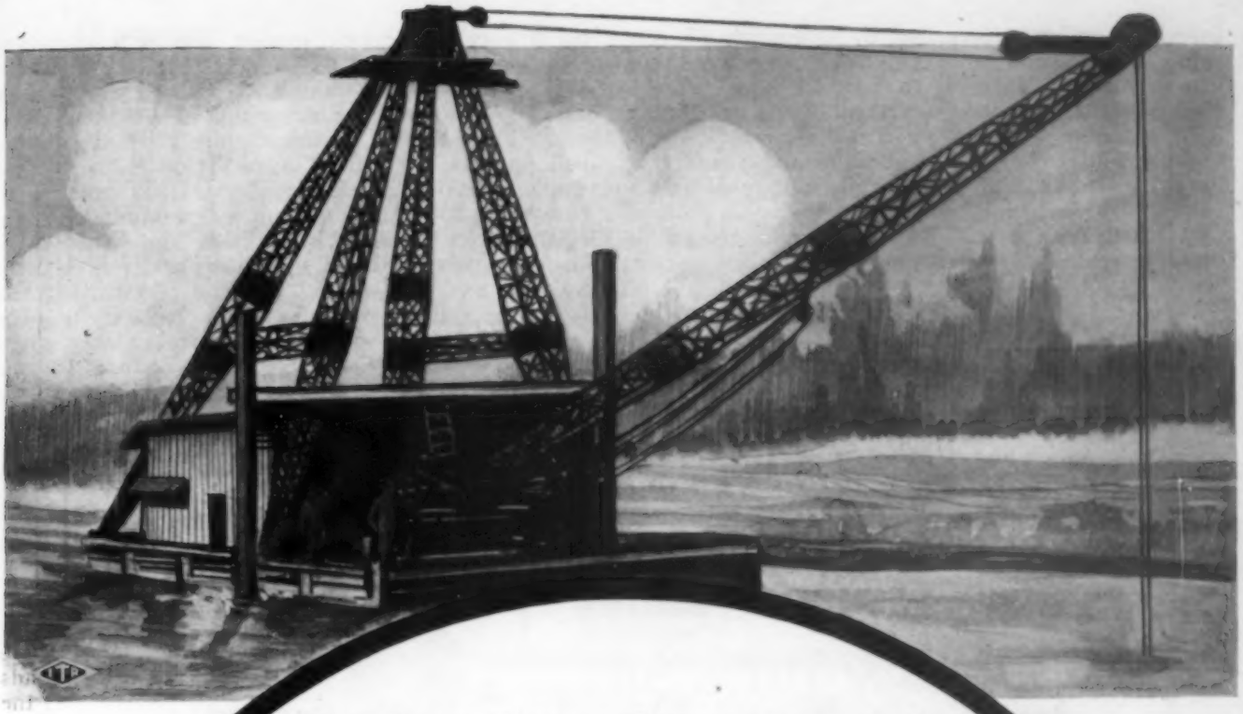
A NUMBER of inquiries have entered the Cleveland machine tool market, and while no large lists have appeared this week the total volume of business continues to touch a high mark. Many dealers state that February, while slightly lower in sales concluded than January, is a record for the month. The unusually heavy buying by the railroads and some of the large industrial concerns in the Cleveland district, has brought the total well into the record-breaking class. The Lima Locomotive Co., Lima, O., is understood to be still negotiating for some small equipment. Deliveries remain unchanged but prices are on the verge of changing. One local dealer states that price advances are to be expected on lathes, milling machines and shapers. Radial drills, planers, heavy forging presses for metal stamping, millers and certain size lathes are finding a ready market.

Much Business Looms for Chicago Dealers

CHICAGO machine tool dealers are finding a few soft spots in the market. For the most part those in need of equipment are buying in small lots and inquiries on large lists are not being received. Pacific coast ship builders have entered the local market and one sale of about $20,000 worth of equipment for this purpose was concluded. Automobile makers have also inquired freely for machinery. The Burlington and Santa Fe railroads have about closed on their former inquiries. The Chicago & North-Western is planning an enlargement of its shops in Chicago and is expected to be in the market.

Some small sales have been made for export recently, the buyer agreeing to postpone shipments from Chicago until the embargo at eastern terminals is removed. Machines built for foreign users, which cannot be shipped, have been offered on domestic orders some weeks ahead of contracts. This is a temporary aid, but when ocean traffic becomes more nearly normal these losses must be made up. Considerable equipment for hydro-electric power plant installations may be placed with local dealers. The city of Joliet, Ill., is about to electrify its plant. Madison, Wis., is remodeling its waterworks and the Indiana Railways, Light & Power Co. plans to build a power plant at Kokomo, Ind. Plans include a turbine engine. The South Dakota Hydro-electric Corporation is planning to develop water power on the Missouri river in that state, with a number of plants.

Machine shops are being planned and in many



Steel that will strengthen your reputation

The dredge works diligently widening and deepening the channels of navigation.

Viewing it from a warm, comfortable spot on the bank, there seems to be nothing to it—just pull a rope and let her go!

But up close where you can hear the whir and grind of the machinery a tremendous strain is apparent.

AGATHON STEELS are specially prepared for all purposes where unusual strains are to be overcome.

No matter whether you are manufacturing dredges, automobiles, locomotives, engines—or anything else that you wish to stand up under the most abusive treatment, be sure you specify AGATHON STEELS for all vulnerable parts.

AGATHON STEELS are being widely used for ***Connecting Rods, Crank Shafts, Driving Shafts, Pistons, Cams, Gears, Springs,*** etc.

AGATHON STEELS

"AGATHON" Chrome Nickel
"AGATHON" Chrome Vanadium
"AGATHON" Nickel Steels
"AGATHON" Vanadium
"AGATHON" Chrome Steel
"AGATHON" High Carbon
"AGATHON" Special Analyses

THE CENTRAL STEEL COMPANY

MASSILLON, OHIO

BRANCH OFFICES:

Detroit Office: 326-27-28 Ford Bldg., F. Walter Guibert, District Representative
Cleveland Office: Hickox Bldg., The Hamill-Hickox Co., District Representative
Chicago Office: Room 1511-12 Lytton Bldg., 14 East Jackson Blvd., A. Schoeffer, District Representative
Philadelphia Office: 902 Widener Bldg., Frank Wallace, District Representative
J. E. Dockendorff & Co., 20 Broad St., New York, N. Y., General Export Agents

cases are under construction by a number of concerns, all needing equipment. The Industrial Mfg. Co., Chicago, is building a machine shop; Cerny, Pucker & Co., makers of ornamental iron in Chicago, have a factory underway; the American Radiator Co. plans to build a machine shop and foundry at its plant at Litchfield, Ill.; the Belle City Mfg. Co. will build a shop unit at Racine, Wis.; the Pullman Co., through the Arnold Co., engineer, is concluding negotiations for its large shops which it plans to erect shortly at St. Louis, Mo.

Few Changes in Cincinnati

THE machinery market in Cincinnati continues to be flooded with inquiries for all makes of tools. Shapers are in better demand than at any time in the history of the local market. Builders of milling machines are from 8 to 12 months behind on deliveries. No special inquiries have come out recently The H. W. Roos Co., Cincinnati, a new concern incorporated at $100,000 to manufacture a shoring device, will purchase equipment in small lots. The Regent Brass Foundry Co., Marysville, O., has been incorporated at $30,000, to operate a brass foundry. The Northwestern Light & Power Co., Van Wert, O., is buying equipment for a sub-station and power house to be located at Delphos, O. The Electric Light & Ice Co., Tomkinsville, Ky., will replace its plant recently damaged by fire, and purchase new equipment. The Chicago Insulated Wire & Mfg. Co. has completed plans for a branch factory at Sycamore, Ill.

New Construction and Equipment

What it is **Where it is** **Who's doing it**

Among New England Factories

BRIDGEWATER, MASS. — Carver Cotton Gin Co., 15 Whitman street, East Bridgewater, has let a contract for the erection of a 1-story, 40 x 110-foot plant addition.

FALL RIVER, MASS.—The Read Brothers ship yard at South Somerset, Mass., was damaged to the extent of $150,000 by fire recently.

MANSFIELD, MASS.—The plant of the Harding Mfg. Co., South Main street, maker of tools and machinery, was damaged by fire with a loss of about $95,000. It will be rebuilt.

TAUNTON, MASS. — The Connecticut Mills Co., which recently acquired the Nemasket Mills, has let contract for a brick, 3-story, 50 x 100-foot addition.

WORCESTER, MASS.—American Steel & Wire Co. is about to erect a 1-story, 70 x 335-foot addition.

BRIDGEPORT, CONN. — Carlson Bros. have let a contract for the erection of a 3-story, 49 x 107-foot plant.

BRISTOL, CONN.—Dunbar Bros. have let a contract for the erection of two 2-story manufacturing buildings, 40 x 100 and 40 x 40 feet, respectively.

WATERBURY, CONN.—Scoville Mfg. Co. is about to start work on a 1-story, 27 x 38-foot addition.

CENTRAL FALLS, R. I. — Salembia & Clay, New York, have let a contract for a brick, 42 x 172-foot weave shed on Hardwin street.

PROVIDENCE, R. I.—The Builders Iron Foundry has let a contract for a brick and steel, mill construction, 2-story, 30 x 100-foot storage building on Dodge street.

PROVIDENCE, R. I.—The city will erect a cantilever or suspension type bridge over the Providence river between Fields Point and Kettle Point, East Providence, at a cost of $1,000,000.

WOONSOCKET, R. I.—Shambow Shuttle Works is about to erect a 2-story, 40 x 40-foot addition.

Along the Middle Atlantic Seaboard

NEW YORK.—Perfect Body Co. has been incorporated with $10,000 capital to manufacture auto bodies and supplies by K. Torjath, P. Magy, and J. Bander, 1042 Kelly St. Bronx.

NEW YORK.—H. E. Gilbert Co. has been incorporated with $100,000 capital to manufacture automatic temperature controling devices by H. F. Lewis, C. E. Miner and H. E. Gilbert, 50 Church street.

NEWARK, N. J.—The International Ticket Co. will erect a 1-story brick factory, 100 x 200 feet, to cost $35,000.

NEWARK, N. J.—The Mass & Walstein Chemical Co.'s plant was damaged to the extent of $15,000 by fire, caused by picric acid which leaked from storage tanks.

NEWARK, N. J.—A. W. Wheaton Brass Works has been incorporated with $40,000 capital to manufacture metal goods by A. W. Wheaton Jr., and Walter Wheaton, Newark.

NEWARK, N. J.—King Mfg. Co. has been incorporated with $10,000 capital to manufacture merchandise of every kind by Harris D. Rush, Westfield, David M. Paley and Brison Howie, New York City.

NEW BRUNSWICK, N. J.—Goetze Basket & Packing Co. has been incorporated with $50,000 capital to manufacture gaskets and engineering supplies by Zeno Schultz, Walter Gierlick, C. Earl Kline and Charles H. Kline, Philadelphia.

WILDWOOD, N. J. — Wildwood Garage Machine Co. has been incorporated with $100,000 capital to manufacture and deal in automobiles, motor cycles, etc., by Walter Butterfield et al.

CHESTER, PA.—The city of Chester plans to erect a 2-story city hall, 50 x 100 feet, to cost $75,000. Clarence W. Frazier, 1133 Broadway, New York City, is preparing the plans.

CLEARFIELD, PA. — The Clearfield Machine Shops has been incorporated with $100,000 capital by Frank B. Reed, Fred B. Reed and Phillip P. Reed.

ELIZABETHTOWN, PA. — The Masonic Home committee of the grand lodge of Pennsylvania plans to erect a 3-story memorial building, 71 x 215 feet, to cost $90,000. E. Emlen Urban, Woolworth building, Lancaster, Pa., is preparing the plans.

ERIE, PA.—Modern Tool Co., manufacturer of grinding machinery, is about to erect a 1-story, 40 x 50-foot plant addition.

EMPORIUM, PA.—The Aetna Co.'s smokeless powder plant was damaged by fire to the extent of $100,000 recently.

FARRELL, PA.—The board of education has awarded A. Wishart & Sons Co., Sharon, a contract to erect a 2-story grade school, 84 x 94 feet, to cost $61,000. E. E. Clepper, First National Bank building, Sharon, is preparing the plans.

FRANKLIN, PA.—Steel & Williams plan to erect a 2-story commercial garage, 75 x 150 feet, to cost $20,000. S. D. Brady, Franklin Trust Building, is preparing the plans.

JOHNSTOWN, PA. — The Johnstown & Stoney Creek railroad plans to replace the following bridges: One at First street with plate steel girder bridge to cost about $20,000; one at Walnut street with steel bridge; plans are being made to raise the structure for the Mexham bridge.

McDONALD, PA.—The G. M. J. Mfg. Co. has been incorporated with $100,000 capital to manufacture automatic car-raising devices; by George M. Johnson, A. W. Behling and Thomas H. Wallace.

MONACA, PA. — The borough council plans to construct a reservoir and purchase new pumps.

MT. AIRY, PA.—B. T. Baker has let a

Preparedness Talks with

ROLLING MILL JIM

Speed up boys, Old Uncle Sam might need all the stuff we can shoot out and then some. Let's get all set to hit her on high. You know what we need to come across. Hubbard Equipment, fellows, then watch our speed.

So long—

Rolling Mill Jim.

Hubbard Steel Foundry Co.

EAST CHICAGO, IND.

All Kinds of Iron and Steel Rolls and Steel Castings.

Say you saw it in THE IRON TRADE REVIEW

contract for erecting 1-story, 58 x 100-foot machine shop and garage.

NEW FLORENCE, PA.—The board of education plans to erect a 2-story school building, 40 x 85 feet, to cost $17,000. W. G. Sloan, Bank and Trust building, Greensburg, Pa., is preparing the plans.

NEW KENSINGTON, PA.—The American Enameling & Mfg. Co. has been incorporated with $10,000 capital by C. W. Buenting and C. A. Rowan, Wilkinsburg; P. W. Morgan and W. L. Hankey, Wilmerding, and John McCartney Kennedy, of Parnassus.

NEW WILMINGTON, PA.—Hartwell & Phillips Co. has been incorporated with $40,000 capital to manufacture farming implements; by J. W. Hartwell, T. F. Phillips, S. P. Penberthey and William McNaughton.

PHILADELPHIA. — Quaker City Iron Works is about to erect a 1-story, 38 x 61-foot engine and boiler house.

PHILADELPHIA. — Electric Service Supplies Co. has let a contract for the erection of a 3-story and basement 60 x 100-foot plant.

PHILADELPHIA.—The Barrett Mfg. Co., Bermuda and Margaret streets, plans to erect a 2-story storage building, 52 x 77 feet, to cost $12,000. The A. Raymond Roff Construction Co., 1635 Thompson street, has been awarded the general contract.

SHARON, PA.—The Sharon Steel Hoop Co. has taken over the plants of the Youngstown Iron & Steel Co., Youngstown, O., and plans to increase its capital to $10,000,000.

SHARON, PA.—The borough of Sharon has awarded A. Wishart & Sons Co. a contract to erect a municipal building, to cost $25,000. Edwin J. Weaver, McDowell Bank building, is preparing the plans.

TITUSVILLE, PA.—Y. W. C. A. plans to erect a 2-story gymnasium, 40 x 60 feet, to cost $10,000. W. O. Teets, I. O. O. F. building, Oil City, Pa., is preparing the plans.

WESTCHESTER, PA.—The board of education plans to erect a 3-story school, 67 x 145 feet and 40 x 60 feet, to cost $120,000. Paul A. Davis, 1713 Sansom street, Philadelphia, is preparing the plans. Dr. Ellwood Patrick, 212 W. Gay street, is president of the board.

WILLIAMSPORT, PA. — City plans to construct a bridge over Grafius Run at Louis street. J. B. Otto, City Hall, is engineer in charge of the work.

DOVER, DEL.—The Foss Pulverizing Coal Burning Co. has been incorporated with $100,000 capital to manufacture the Foss Centrifugal Co.'s pulverizing mill and coal burner, by William S. Pitts, New York, Charles S. Harper and Chandler Weaver, Philadelphia.

DOVER, DEL.—Permanent Highways Corporation has been organized with $600,000 capital to construct public buildings, highways, etc. The incorporators are Arthur W. Britton, S. B. Howard and L. H. Gunther, all of New York.

WILMINGTON, DEL.—Silent Powderless Rapid Fire Gun Co. has been incorporated with $2,000,000 capital to manufacture fire arms, ordnance, ammunition, torpedoes, etc. The incorporators are M. L. Rogers, L. A. Irwin and Harry W. Davis, Wilmington.

Activities in the Central States

ALBANY, N. Y.—Carl H. Page & Co. have been incorporated with $15,000 capital to manufacture autos, motor cars, electric and mechanical appliances, by P. C. Baer, C. H. Page and I. H. Levy, 135 West Seventy-ninth street.

BINGHAMTON, N. Y. — The board of education plans to build an addition, to cost $30,000. T. I. Lacey, 1110 Press building, is preparing the plans. The board also plans to erect a 2-story addition, 62 x 83 feet, to cost $40,000. T. I. Lacey & Son, 1110 Press building, are preparing the plans.

BROOKLYN. — The Garrett Foundry Co. has been incorporated with $50,000 capital as founder and machinist, by C. H. Fowler, A. W. Trotter and J. C. Garrett, 43 McDonough street, Brooklyn.

BUFFALO. — August Feine, 152 Terrace street, plans to erect a garage, 47 x 115 feet.

BUFFALO.—Lewis & Hill, 335 Brisbane building, are preparing plans for a moving picture theater, to cost $40,000.

BUFFALO.—The Bankers' Trust Co. plans to erect an addition, 18 x 70 feet, to cost $10,000. Colson & Hudson, Dun building, are preparing the plans.

BUFFALO.—The city plans to construct a bridge over the canal on Hertel avenue, to cost about $50,000. G. H. Norton is city engineer.

BUFFALO.—M. M. Nowak, 164 Starin avenue plans to erect a 2-story garage. Lewis & Hill, Brisbane building, are preparing the plans.

BUFFALO.—The Westchester Presbyterian church, 726 Delaware avenue, plans to erect a 2 or 3-story parish house, to cost $50,000. Green & Wicks, 110 Franklin street, are preparing the plans.

BUFFALO.—Rice & Adams, manufacturers of dairy machinery, plan to erect a 3-story factory, 50 x 150 feet, to cost $75,000. G. Morton Wolfe, 1377 Main street, is preparing the plans.

BUFFALO.—The Buffalo Cocoa Cola Bottling Co., Inc., 1677 Main street, has awarded Metz Bros., 1295 Fillmore avenue, a contract to erect a warehouse and office building, 27 x 100 feet.

BUFFALO. — Henry Keppel, 29 Riverside avenue, has awarded Edward J. Roth, 134 Royal avenue, a contract to erect a laundry. E. J. Volk, 773 Hertel avenue, is preparing the plans.

ENDICOTT, N. Y.—The Endicott, Johnson Co., Clark street, has awarded the Turner Construction Co., Prudential building, Buffalo, a contract to erect a 6-story tannery, 100 x 125 feet.

ENDICOTT, N. Y.—The First Methodist Episcopal congregation plans to erect a church, to cost $40,000. Jewell, Umbrecht & Hayes, 1108 Press building, are preparing the plans.

GENEVA, N. Y.—Thomas H. Sweeney & Sons, 81 Seneca street, have awarded James E. Flinn a contract to erect a garage and storage battery station, 25 x 75 feet.

Miscellaneous Equipment

Is needed by the Monarch Engineering Co. for a large structural shop, which it has recently purchased in Denver, Colo. The tools which this concern wants may be either new or used. J. A. Cook, purchasing agent, solicits quotations and descriptive data on the following list of equipment:

One pneumatic jaw squeezer, capacity to and including ¾-inch rivets.
One air gun for small rivets.
Wire-bound air hose.
One 18-inch x 10-foot turning lathe, complete.
One 10 or 12-horsepower 3-phase induction motor.
One electric or air 1,000-pound drop hammer for heavy forgings.
One milling machine for 12-inch channel and plate or box columns.
One set of bending rolls for 8-foot plates, ¾ or ½-inch thick.
One combined punch or riveter for corrugated culvert pipe.
One set of corrugated bending rolls, 8 inches in diameter for culvert pipe.
Two industrial push cars and 600 feet of 20 to 30-pound rails.
Punches, dies and similar small tools.
One electric spot welding machine.
One acetylene welding and cutting apparatus.

JAMESTOWN, N. Y.—The board of education plans to erect a 2-story addition, 80 x 160 feet. Phillips, Fidler & Beck, Chadakoin building, are preparing the plans.

JAMESTOWN, N. Y. — The Jamestown Auto Parts Mfg. Co. plans to erect a 2-story factory, 80 x 127 feet. Oscar Lenna, 100 State street, is president of the company.

JAMESTOWN, N. Y. — The National Chautauqua County bank plans to erect a bank building. Phillips, Fidler & Beck, Warren Trust Co. building, Warren, Pa., are preparing the plans.

NIAGARA FALLS, N. Y.—Niagara Falls lodge, No. 88, Fraternal Order of Eagles, plans to erect a 2-story club house, 48 x 90 feet, to cost $25,000. Charles F. Obenhack, Gluck building, is preparing the plans.

NORTH TONAWANDA, N. Y.—The Buffalo Sled Co., Schenk street, plans to erect a factory and warehouse, to cost $150,000. William Steel & Sons, 1600 Arch street, Philadelphia, are the engineers in charge of the work.

ROCHESTER, N. Y.—Packer & Plaksin, 41 Ellwood building, plan to erect a garage, 40 x 157 feet, to cost $11,000.

ROCHESTER, N. Y.—The board of education, J. S. Mullen, president, Municipal building, plans to erect a 3-story junior high school, 220 x 220 feet, to cost $300,000. Gorden & Madden and William G. Kaelber, 300 Sibley block, are preparing the plans.

SYRACUSE, N. Y.—The board of education plans to erect a 2-story school, 177 x 225 feet, to cost $250,000. Sacket & Park, 34 Syracuse Savings Bank building, are preparing the plans.

SYRACUSE, N. Y.—The Knights of Columbus Building Corporation plans to erect a lodge building, to cost $25,000. John J. Sherlock, 206 Canal street, has been awarded the general contract.

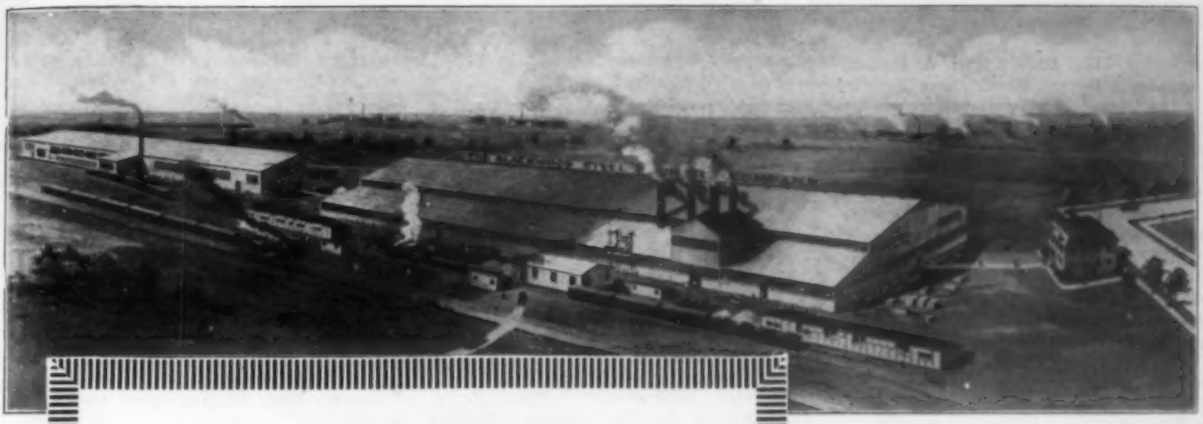
TONAWANDA, N. Y. — The Rudolph Wurlitzer Mfg. Co., 701 Main street, Buffalo, has awarded the Turner Construction Co., Prudential building, Buffalo, a contract to erect a factory.

UTICA, N. Y.—W. Martin, 225 Bleecker street, plans to erect a 6-story hotel to cost about $80,000. The Barnett Architectural Co., Central National Bank building, St. Louis, is preparing the plans.

WATERTOWN, N. Y.—The International Paper Co.'s plant was damaged to the extent of $100,000 by fire recently.

PITTSBURGH.—G. P. Bassett & Co. have been incorporated with $25,000 capital to deal in iron and steel, by D. B. Bradford, G. P. Bassett and John K. Barber.

AKRON, O.—The Banner Foundry Co. has taken out a permit to construct a brick and



Superfine

STEEL CASTINGS

for

Automobiles, Auto Trucks and High Grade Machinery

We also specialize

CASE HARDENING BOXES

and

LEAD and CYANIDE POTS

Made of Specially Prepared Steel

Let us know your requirements

Our large capacity and ideal facilities enable us to supply you highest quality work promptly.

ASK US ABOUT OUR 12-DAY DELIVERY SCHEDULE

Have you tried our

ELECTRIC CASTINGS

of the highest Magnetic Permeability—and our CASTINGS made of SPECIAL ALLOYS?

The Blackwood Steel Foundry Co.

SPRINGFIELD, OHIO

Say you saw it in THE IRON TRADE REVIEW

steel foundry at 216 Newton street. The estimated cost is $13,000.

AKRON, O.—The Biltwell Tire & Rubber Co. is having Architects W. C. Owen & Co., 1900 Euclid avenue, Cleveland, prepare working plans for a new 3-story, 60 x 200-foot factory and a 40 x 60-foot lighting plant. The plans call for an expenditure of $125,000.

ALLIANCE, O. — The Alliance Ice Co. plans to start construction on a new plant within 30 days.

CANTON, O.—The C. & B. Clay Co. has increased its capital from $75,000 to $300,000, to provide for extensive improvements which, it is estimated, will cost $200,000.

CANTON, O. — The Cleveland Axle Mfg. Co.'s plant was damaged to the extent of $150,000 by fire in its drop forge department. It is planned to rebuild the plant with improved facilities.

CINCINNATI. — The Linde Air Products Co. has a building permit for a new factory on Walnut Hills, to cost $42,500.

CINCINNATI.—The Cincinnati Planer Co., Oakley, has been granted a permit for an addition to its machine shop to cost $20,000.

CINCINNATI.—The Cincinnati Grinder Co. will build an entirely new plant in Camp Washington, a suburb, which will contain 50,000 square feet of floor space. The dimensions will be 109 x 229 feet.

CINCINNATI. — Fairbanks, Morse & Co. will move to larger quarters at 347 Fourth street, in the near future. They will occupy a six-story building containing 20,000 square feet of floor space.

CINCINNATI.—The Joseph Joseph & Bros. Co., iron and steel scrap dealer, will build an addition, 40 x 80 feet, two stories, to its plant on Harrison avenue. Plans are in charge of the Reliance Engineering Co., Cincinnati.

CINCINNATI. — The Cincinnati Iron & Steel Co. will build two additions, each 100 x 200 feet, both of which will be covered with sheet steel. They will be used principally for storage. The company is in the market for two, possibly three, traveling cranes.

CLEVELAND.—The Klein Mfg. Co. has increased its capital from $25,000 to $100,000.

CLEVELAND.—The Linde Air Products Co. has increased its capital from $8,750,000 to $15,750,000.

CLEVELAND.—The William Edwards Co. has applied for a permit for a 9-story, 96 x 108-foot warehouse to cost $150,000.

CLEVELAND. — The Torbenson Axle Co. has been granted a permit for a $35,000 brick factory.

CLEVELAND. — The Federal Knitting Mills Co. plans to build a 34 x 143-foot addition to have three stories and to cost $50,000.

CLEVELAND. — Ohio Air Reduction Co. has been incorporated with $100,000 capital by John M. Garfield, Thomas H. Jones, W. T. Kinder, H. O. Jones and R. C. Hiatt.

CLEVELAND. — The Cutler Building Co. is having plans prepared by the Crump Engineering Co., Leader-News building, for an 18-story, fireproof, steel and concrete building.

CLEVELAND. — The Chisholm & Moore Co., 5046 Lakeside avenue, has awarded the general contract for a factory addition, to the McMillan Co., 1794 East Fifty-fifth street.

CLEVELAND. — The A. & M. Castings Co., 10611 Quincy avenue, plans to erect a 62 x 202-foot steel and brick foundry. The Forest City Engineering Co., Hippodrome building, is preparing the plans.

CLEVELAND. — The Winton Co., Berea road, has applied for a permit to erect a factory extension to cost $18,000. The building will be two stories, 66 x 192 feet. The general contracts have been awarded to J. W. Chrisford, 1452 Highland avenue.

CLEVELAND.—The Union Salt Co. has applied for a permit for a $25,000 structure to be erected at Addison road and the New York Central railroad. This company also has taken a permit for a $30,000 foundation, 117 x 143 feet, for another structure at the same location.

CLEVELAND.—W. E. Davis, commissioner of lighting, states present plans for construction and equipment for the municipal lighting system call for an expenditure of $100,000. The first addition will be four stories 80 x 250 feet. Other improvements include four 1,400-horsepower boilers, double-track coal trestle and a 10,000-kilowatt turbine.

COLUMBUS, O.—The Columbus Railway Power & Light Co. plans to erect a $1,000,000 power house.

COLUMBUS, O.—Buckley-Ginter Box Co. has been incorporated with $15,000 capital by C. S. Buckley, C. G. Ginter, H. W. Buckley, Mary M. Ginter and C. V. Buckley.

COLUMBUS, O. — The W. E. Lamneck Co., manufacturer of furnaces, is planning to erect a 120 x 135-foot factory building on West Fifth avenue.

COLUMBUS, O. — Architects Stribling & Lum are preparing plans for the new plant of the Hydraulic Pressed Steel Co., which plans to move here from Mt. Gilead. It is estimated that the new plant will cost about $200,000.

COSHOCTON, O.—Moonaw Clay & Tile Co. plans to incorporate shortly with $200,000 capital and to erect a plant to manufacture facing brick.

DAYTON, O.—The Dayton Rubber Co. plans to erect a new factory on 21 acres recently purchased. The new plant will employ 1,000 men.

DAYTON, O.—Ohio Kitchen Service Co. has been incorporated with $10,000 capital to manufacture household equipment by Charles S. Sollars, Herbert H. Vaugh, B. R. Sollars, M. S. Martin and George R. Murray.

EAST LIVERPOOL, O. — The Standard Oil Co., according to A. C. Smith, local agent, has arranged for the construction of a large distribution station in this city. The plans include a 2-story, 60 x 120-foot warehouse and a number of large supply tanks having a capacity of 120,000 gallons.

FOSTORIA, O.—The Faultless Anchor Co., C. Boehm, general manager, plans to erect a new factory as soon as the weather permits.

GRAFTON, O.—The Valley City Milling Co., whose mill was damaged seriously by fire, plans to move its plant from Valley City to Grafton. The Burrell Engineering Co., Chicago, has the general contract.

LEIPSIC, O. — The Northwestern Ohio Light Co. will begin work soon on a $40,000 plant.

LIMA, O.—The East Iron & Machine Co. has increased its capital from $125,000 to $140,000 to provide for extensions.

LIMA, O. — The Cincinnati, Hamilton & Dayton railroad is planning to rebuild its repair shops here which recently were damaged by fire.

PORTSMOUTH, O.—The Vulcan Last Co. has leased additional space and plans to install new equipment.

TOLEDO, O.—Willys-Morrow Co. has been incorporated with $100,000 capital to manufacture automobile parts by N. E. Hutchens, Harold J. Kehoe, Geo. R. Spencer, Raymond G. Spencer and Chester H. Braselton.

TOLEDO, O.—The Toledo Tap & Die Co., incorporated recently with $50,000 capital, will occupy a new factory building at Clinton street and Oakwood avenue. The new factory is 75 x 250 feet and is two stories high.

WOOSTER, O.—The Buckeye Aluminum Co. has purchased property in South Wooster and plans to erect two buildings, one 40 x 70 feet and the other, 24 x 50 feet.

YOUNGSTOWN, O. — The Obenour-Reed Co. has been incorporated with $10,000 capital to manufacture sheet metal work by Geo. W. Obenour, M. R. Obenour, Mary L. Lechler, et al.

YOUNGSTOWN, O. — Hydraulic Gas Power Co. has been incorporated with $200,000 capital to manufacture pumping machinery by C. H. Booth, A. P. Stecket F. DuP. Thomson, John T. Harrington and U. C. Deford.

WHEELING, W. VA.—The Wheeling Steel & Iron Co. has increased its capital from $7,500,000 to $10,000,000. The company has started to build six new tin mills.

NEWPORT, KY. — Newport Rolling Mill Co. has commissioned Tietig & Lee, architects, to make plans for an extension of 50 x 240 feet which will include additional facilities for the foundry, machine shop, blacksmith and generating shop.

ANDERSON, IND.—The city council is planning to replace the Ninth street bridge by a steel structure.

CAMBRIDGE CITY, IND.—The Mal-Gra Co. will enlarge its foundry.

EAST CHICAGO, IND. — The General American Tank Corporation, Max Epstein, president, 111 West Monroe street, Chicago, will build a 1-story shop 90 x 315 feet.

EAST CHICAGO, IND.—The Cudahy Refining Co., W. H. Isom, president, 111 West Washington street, Chicago, will build a refinery on a 115-acre tract at East Chicago. Leonard Construction Co., 332 South Michigan boulevard, Chicago, is contracting engineer.

GREENSBURG, IND.—The Globe Accessories Co. has been incorporated to manufacture automobile goods with $100,000 capital. J. W. Judkins, Cambridge City, Ind., is president.

INDIANAPOLIS.—The Esterline & Angus Engineering Co. has been incorporated to manufacture machinery with $10,000 capital, by Quincy A. Myers, H. B. Johnson and E. F. McCoy.

KOKOMO, IND.—The Indiana Railways & Light Co. plans to add a power plant, including boilers and turbine engine, to cost $150,000.

MARION, IND.—The Osborn Paper Co., 1119 South West street, will build a 3-story factory 88 x 270 feet.

MUNCIE, IND.—The Warner Gear Co. has increased its capital from $500,000 to $1,500,000.

RICHMOND, IND.—A bond issue of $100,000 has been authorized to pay for the South G street bridge.

SOUTH BEND, IND. — The Automobile Dump Car Co. has been incorporated to build automatic dump cars with $25,000 capital by P. C. Fergus, M. L. Petro and A. L. Herr.

SOUTH BEND, IND. — The Studebaker Corporation, Detroit, it is announced, will begin soon the erection of a continuous gray iron foundry 140 x 450 feet, with three cupolas. A forge shop 160 x 200 feet, will also be erected. The contracting engineer is J. L. Stewart, 30 Church street, New York.

WABASH, IND.—The Service Truck Co. is making arrangements for additions to its plant.

CRAWFORD ORE

LAMBERT ORE

PENNINGTON ORE

from our Open Pit Mines
for making BASIC and FOUNDRY Irons

Coarse Structure—Desirable Analysis

The Tod-Stambaugh Company
Perry-Payne Building
CLEVELAND - - OHIO

CASEY, ILL.—A water works and pumping station will be built by the city on plans by Miller & Holbrook, of Decatur, including a boiler and engine and two pumps, of 400 to 500 gallons per minute capacity.

CHICAGO.—The Knapp Bros. Mfg. Co., manufacturer of steel specialties, has increased its capital from $50,000 to $100,000.

CHICAGO.—The Goodman Mfg. Co., manufacturer of mining machinery, has let contracts for additions to its plant.

CHICAGO.—The Chicago Junction railroad will build a steel bridge at Forty-second and Robey streets.

CHICAGO.—The Chicago sanitary district plans to build a 28-horsepower hydro-electric plant on Brandon road near Joliet.

CHICAGO. — The board of public works will take contracts on several bridges, aggregating $850,000.

CHICAGO.—The Aldon Co., manufacturer of railway supplies will build a 1-story plant costing $10,000. R. G. Pierce, 10 South La Salle street, is the architect.

CHICAGO.—Cerny Puckas & Co., manufacturers of ornamental iron, 2700 South Crawford avenue, will build a factory 99 x 145 feet, to cost $26,000.

CHICAGO.—The E. Popher Iron Co. has been incorporated with $50,000 capital by T. J. Deering, W. M. Klein and William Ruthmann, 38 South Dearborn street.

CHICAGO.—The American Radiator Co., 816 South Michigan avenue, will add a machine shop and foundry to its plant at Litchfield, Ill.

CHICAGO.—The Illinois Central railroad, A. S. Baldwin, shipping manager, will build a shop and roundhouse at Palestine, Ill., costing $100,000.

CHICAGO.—The Powdered Coal Engineering & Equipment Co., McCormick building, has leased property at Western avenue and Washington boulevard and is remodeling the structure for a demonstration plant.

CHICAGO.—M. F. Stauch, 1356 Diversey Parkway, is making plans for a 2-story machine shop, 100 x 100 feet, to cost $50,000, on which bids will be taken about March 5. The owner's name is withheld.

CHICAGO. — Morris Glendenning, 2256 West Forty-ninth street, will build a 1-story factory building for use by V. F. Ridgeway and H. C. Quest for the manufacture of steel products.

CHICAGO.—The Chicago & Northwestern railroad, R. H. Aishton, president, 226 West Jackson boulevard, will build additions to three shop buildings in Chicago, 183 x 208 feet, 50 x 200 feet and 58 x 200 feet.

CHRISTOPHER, ILL. — The Franklin County Traction Co. has been incorporated to build an interurban line from North City to Benton by way of Christopher, with $50,000 capital, by C. W. Gardner and C. C. Baldwin.

JOLIET, ILL. — The main waterworks pumping station is to be electrified at a cost of $25,000. The engines are of 1,000,000, 2,000,000 and 3,000,000-gallon capacity and will be operated by 30, 60 and 100-horsepower, three-phase, 4,000-volt motors. Bids are being taken.

LA SALLE, ILL.—Matthiessen & Hegeler Zinc Co. has awarded the contract to the Worden-Allen Co. for about $75,000 for two new furnace buildings.

LITCHFIELD, ILL.—The Wangler Boiler & Iron Works plans to build a plant.

MOLINE, ILL.—The Moline Plow Co., G. A. Stephens, president, has let the contract to Stone & Webster for a 1-story machine shop addition 100 x 300 feet, to cost $50,000.

SAVANNA, ILL. — The Peoples Gas & Electric Co. will install a 500-kilowatt steam turbine and will build a transmission line to Mt. Carroll. T. P. Bowen is manager.

SPRINGFIELD, ILL.—The city council is considering the construction of a reinforced sewer 14 feet square at the cost of $150,000.

SYCAMORE, ILL.—The Chicago Insulated Wire & Mfg. Co., H. F. Boardman, manager, 53 West Jackson boulevard, Chicago, will build a factory and office building 50 x 300 feet and 40 x 50 feet, to cost $50,000.

APPLETON, WIS. — The Valley Iron Works has increased its capital from $60,000 to $200,000 and will make extensions. W. A. Fannon is president.

CUDAHY, WIS. — The Federal Rubber Mfg. Co. plans an addition to its power house costing $200,000. H. M. Hope, 185 Devonshire street, Boston, is engineer.

KALAMAZOO, MICH.—The Fuller & Sons Mfg. Co. has awarded to the Byers Bros. Construction Co. the contract for a large addition to its plant. The new building will be 61 x 106 feet and will cost about $100,000.

SHEBOYGAN, WIS. — The Joerns Bros. Mfg. Co.'s plant was damaged to the extent of $100,000 by fire recently. The company makes furniture.

ALMA, MICH.—The Western Carburetor Co. has been incorporated with $120,000 and contracts have been let for a plant.

DETROIT. — The Detroit Twist Drill Co. will build a 2-story addition.

DETROIT. — The Bower Rolling Bearing Co. has increased its capital from $300,000 to $600,000.

DETROIT.—The Wayne Tool Co. has been incorporated with $10,000 capital by George A. Gloor, William Schenk and A. L. Gloor.

DETROIT.—The A. B. C. Starter Co. will build a 2-story factory 60 x 200 feet. C. Seider, 33 East Woolbridge avenue, is president.

South of Mason-Dixon Line

CHATTANOOGA, TENN. — The Chattanooga Gas & Coal Products Co. plans to add 24 new ovens to its plant at Alton Park.

HATTIESBURG, MISS.—The New Orleans & Northeastern railroad, now a part of the Southern railroad system, plans to double track its line from Meriden to New Orleans, with 105-pound rails as soon as the survey can be made.

LAKE CHARLES, LA. — The Christy & Eastern railroad recently organized plans to build a line from Christy to connect with the Red River & Gulf road. It will be 60 miles long.

BEAUMONT, TEX.—The Texas Steel Co., L. P. Featherstone, Keith building, president, plans to build a plant on the water front.

CHILLICOTHE, TEX.—The Haris, Irby & Vose Co. will build an oil mill costing $100,000.

FORT WORTH, TEX.—Fort Worth Pump & Windmill Co. has been incorporated with $25,000 capital by R. P. Turbeville and W. L. Armstrong, of Fort Worth, and J. T. Morrison, of Noble county, Indiana.

LONGVIEW, TEX. — Plans will be completed by March 15 for a sewage disposal plant of 250,000 gallons daily capacity. H. N. Roberts is city engineer.

PORT ARTHUR, TEX.—The Port Arthur Light & Power Co. will build an addition and install new machinery. The additions will include a power house 46 x 97 feet, 50 feet high, a 40-ton crane, 4,000-kilowatt horizontal steam turbine and two 600-horsepower, oil-fired water-tube boilers.

SAN ANTONIO, TEX. — The Southern Welding & Machine Co. will build a 2-story plant, 60 x 110 feet, to cost $12,000.

WACO, TEX. — The Stubbs Foundry & Machine Co. is planning to build a plant costing $100,000.

WICHITA FALLS, TEX.—Three bridges are to be built by the county to cost $80,000.

Mississippi to the Rockies

PERU, ILL.—S. D. Porter, La Salle, is making plans for a 720,000-gallon, reinforced concrete reservoir, 80 x 80 x 15 feet and a pump.

BELOIT, KAS.—The city of Beloit plans to install a 150-horsepower boiler, steel stack and a filtration and water softening plant. Black & Veatch, Kansas City, Kas., are engineers.

BUNKER HILL, KAS.—Plans are being prepared by W. B. Rollins Co., Kansas City, Kas., for a water works and electric light plant. Bonds will be issued shortly.

CALDWELL, KAS. — Bonds for $80,000 have been voted for rebuilding and re-equipping the municipal water and light plant.

KANSAS CITY, KAS.—The city plans to construct a 10,000,000-gallon reinforced concrete reservoir.

TOPEKA, KAS.—The Hossfeld trunk factory was partially destroyed by fire. The loss was about $60,000.

OMAHA, NEB.—The Bowen Transit Co. has been incorporated to manufacture motor passenger and freight cars with $50,000 capital by A. D. Bowen and C. A. Bennett.

GREAT FALLS, MONT.—Boston & Montana Development Co. will erect a 500-ton concentrator.

HELENA, MONT.—Helena Light & Railway Co. will spend from $60,000 to $80,000 for improvements including new ties and heavier rails.

TAHLEQUAH, OKLA.—Bids will be received soon on a waterworks and filtration plant, including a reservoir 60 x 90 feet, 9 feet deep, two centrifugal pumps to cost $30,000. E. B. Murray, Kansas City, Mo., is engineer.

CASA GRANDA, ARIZ.—Bids have been asked on an electric and power plant and water works system to cost $30,000. V. A. Thompson, Phoenix, is engineer.

CLIFTON, ARIZ. — Bonds for $160,000

have been voted for a steel bridge and for flood protection work.

BOISE, IDA.—Boise, Twin Falls & Nevada railroad has been incorporated with $3,000,000 capital by David Miller, Kansas City; W. E. Pierce and J. H. Richards, Boise; to construct line from Bruneau Valley to Boise, 90 miles.

GRANGEVILLE, IDA. — The Grangeville Electric Light & Power Co. plans to build a reinforced concrete dam costing from $40,000 to $60,000. T. A. Bayless is superintendent.

HIBBING, MINN.—The village of Hibbing will build a power house to cost $200,000. Tyrie & Chapman, Auditorium building, Minneapolis, are architects.

STILLWATER, MINN.—The Central Construction Co. plans to erect two buildings 40 x 70 feet and 24 x 50 feet, respectively.

ST. PAUL, MINN.—The Accessory Mfg. Co., manufacturer of automobile rims and other accessories will build a plant to cost $50,000.

ST. PAUL, MINN.—The St. Paul Gas & Light Co. is planning to build an electric light plant on the Mississippi river to cost $1,000,000.

ST. PAUL, MINN.—The Guenther Mfg. Co. has been incorporated to manufacture tools and machines with $25,000 capital by Emil Kroening, G. E. Guenther and M. R. Guenther.

WEST MINNEAPOLIS, MINN. — The village of West Minneapolis plans to build a gas plant including a brick and concrete building, water gas machine, scrubber, and boiler and a 10,000 to 30,000-cubic foot capacity holder.

WINONA, MINN.—The Chicago & Northwestern railroad plans to build a machine shop and add to its roundhouse, at a cost of $400,000.

SPRINGFIELD, MO.—The Lightfoot Steel Corporation has been incorporated with $100,000 capital by M. D. Lightfoot, H. R. Awbrey and O. T. Hamlin. A plant will be built at once, 80 x 100 feet, costing $10,000.

ST. LOUIS.—The Fulton Iron Works will build a forge shop. J. F. O'Neil, 1259 Delaware avenue, is president.

ST. LOUIS.—Fire did $20,000 damage recently to the plant of the Mississippi Valley Iron Co., South Broadway.

ST. LOUIS.—The Wagner Auto Lock Co. has been incorporated with $50,000 capital by Bernard Mohr, Paul Lehmann and Edward Wagner.

ST. LOUIS.—The Acme Boiler & Sheet Iron Co. has been incorporated with $15,000 capital by Frederick Jones, and Andrew J. Getz.

ST. LOUIS.—The Pullman Co., Chicago, will build a steel and brick shop on National Bridge road. The Arnold Co., 105 South La Salle street, Chicago, is engineer.

DAVENPORT, IA. — The Peoples Light Co. is planning improvements to the cost of $50,000.

DAVENPORT, IA.—The Machine Tool & Supply Co. has been incorporated with $10,000 capital by J. H. Gerdies, J. R. Lane and M. W. Iles.

DUBUQUE, IA. — The Adams Co., 550 Fifth street, will build a 2-story factory 72 x 250 feet. K. E. Saam, 428 Security building, is architect.

MASON CITY, IA.—The Hawkeye Supply Co., manufacturer of plumbing supplies will build an addition to its plant.

NEWTON, IA.—The Maytag Co., manufacturer of agricultural implements, will build a 1-story foundry, 90 x 100 feet to cost $25,000. E. L. Maytag is manager.

The Pacific Coast States

ABERDEEN, WASH.—R. S. Talbot, Spokane, head of the Inland Empire Pulp & Paper Mills, will build a 50-ton per day pulp and paper mill at Aberdeen, costing $750,000.

COLFOX, WASH. — Kincaid Machinery Co. has been incorporated with $25,000 capital by Horace Howard, W. G. Carr, J. E. Kincaid and J. L. Neilly.

INDEX, WASH.—City has voted a $20,000 bond issue for a light and water system.

SEATTLE.—F. A. Rapp, engineer, is preparing plans for a Howe truss design drawbridge, 293 feet long, 20-foot roadway, to cost $70,000.

SPOKANE, WASH. — Jack Mining Co. plans to construct a 100-ton concentrating plant to cost about $35,00.

TACOMA.—The Bilrowe Alloys Co. will build an addition.

TACOMA.—The Pacific Steel & Boiler Co. plans to build an addition. O. T. Nelson is president.

TACOMA, WASH. — Wheeler-Osgood Co. will erect a $30,000 to $40,000 power plant. Four boilers will be installed.

LA GRANDE, ORE. — Improvements for this year on this division of the Oregon-Washington Railway & Navigation Co. include the laying of 34 miles of 100-pound steel rails.

OREGON CITY, ORE.—The Oregon City Foundry has been incorporated with $20,000 capital by J. A. Roake, L. V. Roake and C. H. Roake.

PORTLAND, ORE.—The W. H. Averill Machinery Co. has bought a site and will build an assembling plant to cost $40,000.

PORTLAND, ORE.—North Bank railroad plans to spend $1,000,000 for improvements during 1917.

LOS ANGELES, CAL. — The California Metal Enameling Co. has increased its capital from $25,000 to $100,000 and will add to its plant.

OAKLAND, CAL.—The Jensen Machinery Co. suffered $20,000 damage to its plant by fire.

OAKLAND, CAL.—The Valveless Rotary Pump Co. has had plans prepared for a factory to cost $150,000.

SANTA MONICA, CAL. — The city of Santa Monica plans to buy seven waterworks pumps and to build a 2,000,000-gallon reservoir.

The Dominion of Canada

CHIGNECTO, N. S.—The Maritime Coal, Railway & Power Co. will be in the market soon for electric pumps, transformers, motors, switchboards, etc. R. J. Bell is general manager.

PORT HOOD, N. S.—The Port Hood Coal Co. is opening a new mine and proposes to erect new buildings and purchase machinery.

MONTREAL.—The Standard Steel & Tempering Co. has been incorporated to operate foundries and machine shops with $50,000 capital; by Louis A. David, S. H. R. Bush, Benjamin Robinson et al.

WEEDON, QUE.—The city council, Sherbrooke, Que., proposes to purchase Two Miles Falls at Weedon and to erect power plant and transmission lines to Sherbrooke, at a cost of $1,500,000. Francis & Co., Montreal, are consulting engineers.

BRANTFORD, ONT. — The Baynes Carriage Co. has been incorporated to manufacture automobiles and trucks with $50,000 capital by James Harley, Edmund Sweet, Archibald M. Harley and others of Brantford.

LONDON, ONT.—The Crow Motor Car Co., Mount Brydges, Ont., is making preparations for erecting an automobile plant at London to cost $100,000. A. Eisenbach is manager of the company.

LONDON, ONT. — The London & Port Stanley railway board will shortly be in the market for a work car completely equipped for line work on electric railway to cost $25,000.

NIAGARA FALLS, ONT. — Construction work will be started immediately on the erection of a new plant at Niagara Falls, for the American Cyanamid Co. whose plant was recently damaged by fire to the extent of $250,000.

PEMBROKE, ONT. — The Superior Electric Co. has been incorporated to manufacture tools and motors, with $100,000 capital; by John H. Reeves, Leonard S. Mackie, James R. Lockhart and others.

PORT ARTHUR, ONT. — The Ontario hydroelectric commission, Toronto, will build a power plant and spend $2,500,000 on power development at Port Arthur, Ont. F. A. Gaby, Toronto, is engineer.

RAINY RIVER, ONT. — The Canadian Northern Railway Co., Winnipeg, Man., will build a roundhouse at Rainy River, Ont.

ST. CATHARINES, ONT. — The T. F. Shurly Co. has been incorporated to manufacture iron and steel tools and implements with $200,000 capital by Theodore F. Shurly, George B. Burson, Harry Short et al.

WESTPORT, ONT.—The Dominion Cutlery Co., Ltd., Montreal, Que., has secured buildings at Westport, Ont., in which it will install machinery and equipment for the manufacture of drop forgings, automobile parts, knives, scissors, etc.

WINNIPEG, MAN.—The Richardson Separator Co., Minneapolis, has purchased a site at the corner of Winnipeg avenue and Myrth street, and will build a manufacturing plant.

VANCOUVER, B. C.—The Dominion Safe Works has purchased a site and soon will erect a plant.

VANCOUVER, B. C.—John Coughlan & Sons have taken out a permit to erect a machine shop and mold loft at False Creek to cost $25,000.

IRON AND STEEL PRICES

Corrected up to Tuesday noon

PIG IRON

Bessemer valley	$35.00 to 36.00
Bessemer, Pittsburgh	35.95 to 36.95
Basic, Pittsburgh	30.95
Basic, eastern Pa.	30.50 to 31.00
Basic, Buffalo	35.00
Malleable, Pittsburgh	35.95 to 36.95
Malleable foundry, Chicago	34.00
Malleable foundry, Philadelphia	37.00 to 38.00
Malleable foundry, Buffalo	35.00
No. 1X foundry, Philadelphia	34.75 to 35.50
No. 2 foundry, Pittsburgh	33.95 to 35.95
No. 2 foundry, Cleveland	35.30
No. 2 foundry, Ironton	35.00
No. 2 foundry, Chicago	34.00
No. 2X foundry, Philadelphia	32.75 to 33.75
No. 2X foundry, N. J. tidewater	33.75 to 34.75
No. 2X foundry, Buffalo	35.00
No. 2 plain, Philadelphia	33.25 to 33.75
No. 2 plain, N. J. tidewater	33.25 to 33.75
No. 2 plain, Buffalo	35.00
No. 2 southern, Birmingham	25.00 to 30.00
No. 2 southern, Cincinnati	27.90 to 33.90
No. 2 southern, Chicago	29.00
No. 2 southern, Phila. delivery	30.00 to 32.00
No. 2 southern, Cleveland	28.00 to 30.00
No. 2 southern, New York docks	29.25 to 30.25
No. 2 southern, Boston docks	30.00 to 32.00
No. 2 south. interior, New Eng.	30.00 to 32.00
No. 2 southern, St. Louis	
Virginia, No. 2X furnace	32.00 to 34.00
Virginia, No. 2X, Philadelphia	34.75 to 36.75
Virginia, No. 2X, Jersey City	35.00 to 37.00
Virginia, 2X, Boston points	35.25 to 37.25
Gray forge, eastern Pa.	30.00 to 31.00
Gray forge, Pittsburgh	31.95
Gray forge, Birmingham	24.00
Silveries, 8 per cent, furnace	40.00
Silveries, 8 per cent, Chicago	42.00
Low phos. Standard, Phila.	60.00 to 62.00
Low phos. Lebanon, Pa., furnace	55.00 to 60.00
Low phos., Pittsburgh	52.00 to 54.00
Charcoal, Lake Superior, Chgo., Nos. 1 to 4	36.75 to 37.75
Charcoal, Buffalo	24.00 to 27.00
Charcoal, Birmingham	26.00 to 27.00

IRON ORE

Lake Superior Ores. Lower Lake Ports.

Old range Bessemer, 55 per cent, ton	5.95
Messabi Bessemer, 55 per cent, ton	5.70
Old range non-Bes., 51½ per cent, ton	5.20
Mesabi non-Bess., 51½ per cent, ton	5.05

Port Henry Ores. Per unit delivered eastern Pa. All non-Bessemer.

Old Bed, crude, 58 per cent	10.50c to 11.00c
Old Bed, concent., 65 per cent.	11.00c to 11.50c
Harmony concent., 63 per cent.	11.50c to 11.75c
Lump (at mines)	$5.75

COKE

(At the ovens.)

Connellsville furnace	$12.00 to 13.00
Connellsville furnace, contract	8.00 to 8.25
Connellsville foundry, 2nd half	6.50 to 6.75
Connellsville foundry, 1st half	9.00 to 10.00
Connellsville foundry	13.00 to 14.00
Wise county furnace, contract	7.00 to 9.00
Wise county foundry, contract	7.50 to 11.00
Pocahontas foundry, contract	7.50 to 11.00
Pocahontas furnace, contract	7.00 to 9.00
New River foundry, contract	8.50 to 11.00
New River furnace, contract	7.50 to 9.50

FERRO ALLOYS AND STEEL MAKING METALS

Ferro manganese, 80 per cent, delivered prompt	$250 to 275
Ferro manganese, 80 per cent, seaboard and deliv'd, contract.	185 to 250
Spiegel, 20 per cent furnace by July	75.00 to 80.00
Spiegel, 20 per cent, furnace, last half	60.00 to 65.00
Ferro-silicon, 50 per cent, Pbgh., nominal	175 to 225

Bessemer ferro-silicon, 9 per cent to 10 per cent, $46.00; 10 to 11 per cent, $47.00; 11 to 12 per cent, $48.00; 12 to 13 per cent, $49.00 a ton at the furnace at Ashland, Jackson and New Straitsville, O.

Ferro-carbon titanium, 8 to 12½ cents per pound in carloads.

SEMI-FINISHED MATERIAL

Open hearth billets, Phila.	$60.00 to 65.00
Forging billets, Phila.	75.00 to 85.00
Forging billets, Pbgh., nominal	90.00 to 100.00
Forging billets, Chicago	70.00
Wire rods, Pittsburgh	75.00 to 85.00
Bessemer billets, Youngstown	65.00
Bessemer billets, Pittsburgh	$65.00
Open hearth billets, Pittsburgh	65.00
Open hearth billets, Youngstown	65.00
Bess. sheet bars, Youngstown	65.00
Op. h'th sheet bars, Youngstown	65.00
Bess. sheet bars, Pittsburgh	65.00
Open hearth sheet bars, Pbgh.	65.00
Muck bars, Pittsburgh (nominal)	50.00
Grooved steel skelp	3.25c
Sheared steel skelp	3.75c

RAILS AND TRACK MATERIAL

(Gross tons.)

Stand. Bes. rails, Pbgh. & Chgo.	$38.00
Stan. op-h'th rails, Pbgh. & Chgo.	40.00
Light rails, 8 to 10 lbs., Pbgh.	53.00
Light rails, 8 lb., Chicago	50.00
Light rails, 12 to 14 lbs., Pbgh.	52.00
Light rails, 12 lbs., Chicago	49.00
Light rails, 16 to 20 lbs., Pbgh.	51.00

Freight Rates, Pig Iron

Mahoning and Shenango valleys to:—

Cleveland	$0.95
Newark, N. J.	2.98
Boston	3.18
Philadelphia	2.78
Pittsburgh	.95
St. Louis	3.18
Minneapolis, St. Paul	4.54

Buffalo to:—

Albany, N. Y.	$1.26
New England (all rail)	2.58
New York and Brooklyn (all rail)	2.58
New York and Brooklyn (by canal)	1.25 to 1.60

Virginia furnaces to: —

Boston docks (r. and w.)	$3.05
New England (all rail)	3.25
New York dock (r. and w.)	2.88

Birmingham, Ala., to:—

Cincinnati	$2.90
Chicago	4.00
Cleveland	4.00
Louisville, Ky.	2.65
Minneapolis, St. Paul	5.85
New York (all rail)	6.15
New York (r. and w.)	4.25
Philadelphia (all rail)	5.20
Philadelphia (r. and w.)	4.00
Pittsburgh	4.90
Savannah, Ga.	2.75

Chicago to:—

Des Moines	$2.80
Milwaukee	.50
Minneapolis, St. Paul	2.00
Moline, Ill.	1.40
Omaha	3.58
St. Louis	1.58

Ironton and Jackson, O., to:—

Chicago	$2.54
Cincinnati	1.26
Cleveland	1.62
Detroit	1.81
Indianapolis	1.58
Minneapolis, St. Paul	4.54

Duluth, Minn., to:—

Minneapolis-St. Paul	$1.25

Mayville, Wis.:—

Minneapolis-St. Paul	$1.75
Light rails, 16 to 20 lbs., Chgo.	$48.00
Light rails, 25 to 45 lbs., Pbgh.	50.00
Light rails, 25 to 45 lbs., Chgo.	47.00
Relaying rails, standard, Pbgh. and Chicago	$33.00 to 34.00
Relaying rails light, Chicago	34.00 to 35.00
Angle bars, st. sect., Pbgh. base	2.25c to 2.75c
Angle bars st. sections, Chgo.	2.25c to 2.75c
Spikes, railroad, Pittsburgh	3.40c
Spikes, railroad, Chicago	3.50c
Track bolts, Pittsburgh	4.50c to 5.00c
Track bolts, Chicago	4.50c to 4.60c
Tie plates, Chicago	$55.00 to 60.00

SHAPES, PLATES AND BARS

Structural shapes, con. Pbgh.	3.25c
Structural shapes, Philadelphia	3.409c to 3.659c
Structural shapes, New York	3.419c to 3.669c
Structural shapes, Chicago	3.44c to 4.00c
Tank plates, Chicago	3.94c to 4.50c
Tank plates, Pittsburgh (con.)	3.75c to 4.00c
Tank plates, Pittsburgh	4.50c to 4.75c
Tank plates, Philadelphia	3.909c to 5.159c
Tank plates, New York	3.919c to 5.169c
Bars, soft steel, Chicago	3.19c to 3.50c
Bars, soft steel, Pittsburgh	3.00c to 3.25c
Bars, soft steel, New York	3.169c to 3.419c
Bars, soft steel, Philadelphia	3.159c to 3.409c
Hoops, carloads, Pbgh. contr.	3.50c
Hoops, Pittsburgh	4.25c to 4.50c
Bands, Pittsburgh	4.10c to 4.35c
Bands, Pittsburgh (contr.)	3.00c
Shafting, Pbgh., contr. carloads	10 to 20 off
Bar iron, Chicago	3.00c
Bar iron, Philadelphia	3.159c
Bar iron, Cleveland	3.00c
Bar iron, New York	3.169c
Bar iron, Pittsburgh	3.25c
Hard steel bars, Chicago	3.00c

SHEETS

(In cents per pound.)

(Open hearth material takes 10c above prices of bessemer.)

SHEET MILL BLACK.

Gage.	Bessemer.
17 to 21	4.55 to 5.30
22 to 24	4.60 to 5.35
25 and 26	4.65 to 5.40
27	4.70 to 5.45
28	4.75 to 5.50
29	4.80 to 5.55
30	4.90 to 5.65

TIN MILL BLACK.

Gage.	Bessemer.
15 and 16	4.55 to 5.30
17 to 21	4.60 to 5.35
22 to 24	4.65 to 5.40
25 to 27	4.70 to 5.45
28	4.75 to 5.50
29 and 30	4.80 to 5.55
30½ and 31	4.85 to 5.60

GALVANIZED.

Gage.	Bessemer.
10 and 11	5.50 to 6.25
12 to 14	5.60 to 6.35
15 and 16	5.75 to 6.50
17 to 21	5.90 to 6.65
22 to 24	6.05 to 6.80
25 and 26	6.20 to 6.95
27	6.35 to 7.10
28	6.50 to 7.25
29	6.70 to 7.45
30	6.90 to 7.65

BLUE ANNEALED.

Gage.	Bessemer.
3 to 8	4.50 to 5.00
9 to 10	4.50 to 5.00
11 to 12	4.50 to 5.00
13 and 14	4.50 to 5.00
15 and 16	4.50 to 5.00

No. 28 black, Chicago	5.19c to 5.44c
No. 28 galvanized, Chicago	6.50c to 6.75c
No. 10 blue annealed, Phila.	4.659c to 5.159c
No. 10 blue annealed, Chicago	4.94c to 5.19c

TIN PLATE

Tin plate, 100 lb., coke base, contract	7.50c to 8.50c
Tin plate, coke base, prompt	8.25c to 8.75c
Terne plate I. C.	6.00c
Terne plate, long	7.00c to 7.50c

IRON AND STEEL PIPE

(Prices adopted Feb. 14, 1917.)

Steel.

Diameter in inches.	Black.	Galv.
	Per cent off.	
⅛, ¼ and ⅜, butt	55	28½
½, butt	59	44½
¾ to 3, butt	62	48½
2, lap	55	42½
2½ to 6, lap	58	45½
7 to 12, lap	55	41½
13 and 14, lap	45½	....
15, lap	43	....

Iron.

(Prices adopted Feb. 14, 1917.)

Standard weight, threads and couplings, diam. in inches.	Black.	Galv.
	Per cent off.	
⅛ and ¼, butt	44	17
⅜, butt	45	18
½, butt	49	31
¾ to 1½, butt	52	36
1¼, lap	38	23
1½, lap	44	30
2, lap	45	31
2½ to 6, lap	47	34
7 to 12, lap	46	33

BOILER TUBES

(Price adopted Nov. 20, 1916.)

Steel, 3½ to 4½ inches, l. c. l.	46
Iron, 3½ to 4½ inches l. c. l.	36

IRON AND STEEL PRICES

Corrected up to Tuesday noon

WIRE PRODUCTS

(Adopted Nov. 24, 1916.)
(Retailers' prices 5 cents above jobbers' quotations.)

Wire nails, jobbers', Pittsburgh	$3.00
Coated nails	3.00 to 3.15
Plain wire, jobbers', Pittsburgh	2.95
Galvanized wire, jobbers', Pbgh	3.65
Polished staples, Pbgh	3.15
Galvanized staples, Pbgh	3.85
Barb wire, painted, jobbers', Pbgh.	3.15
Barb wire, galv., jobbers', Pbgh	3.85

BOLTS AND NUTS

(Delivered within 20-cent freight radius.)

Carriage bolts, ⅜ x 6 inches, smaller or shorter, rolled thread, 40 and 10; cut threads, 40 and 2½, larger or longer, 30 and 5.

Machine bolts with hot pressed nuts ⅜ x 4 inches, smaller or shorter rolled 50; cut, 40 and 10; larger or longer, 35 and 5.

Cold pressed, semi-finished hexagon nuts, 50, 10 and 5.

Gimlet and cone point lag bolts, 50. Hot pressed square nuts, blanks, $2.50 off; tapped $2.30 off. Hot pressed hexagon nuts, blank, $2.50 off; tapped, $2.30 off.

Cold pressed square nuts, blank, $2.10 off; tapped, $1.90 off. Cold pressed hexagon nut, blank, $2.25 off; tapped, $2.00 off.

RIVETS

Structural rivets, Pbgh	4.25c
Boiler rivets, Pbgh	4.35c
Tinner's rivets, 40 and 10 off, Pittsburgh.	

STEEL SHEET PILING

(Pittsburgh.)

Base sizes	3.00c

STANDARD STEEL CHAIN

Chain, ¼ inch proof coil	6.00c

COLD ROLLED STRIP STEEL

Base price, 7.00c to 7.50c per 100 pounds, hard, coils 1½ inches and wider and by .100 inch and heavier.

CAST IRON WATER PIPE

Four-inch, Chicago	$45.50
Six-inch and larger, Chicago	42.50
Six-inch Class B, New York	41.50
Four-inch Class B, New York	44.50
Four to six-inch Birmingham	40.00
Six-inch and larger, Birmingham	37.00

Light weight water and gas pipe $1 per ton higher than standard water.

WAREHOUSE PRICES

Steel bars, Chicago	3.75c
Steel squares, 2-in. & ov., Cleve.	4.50c
Steel bars, und. 2 in., Cleveland	4.00c
Steel rounds, 2-in. & ov., Cleve.	4.50c
Steel bars, Detroit	3.75c
Steel bars, Philadelphia	4.00c
Steel bars, New York	4.00c
Steel bars, St. Louis	3.80c
Steel bars, Cincinnati	3.90c to 4.45c
Steel bars, St. Paul	3.85c
Steel bars, over 2-in., Buffalo	4.50c
Steel bars, Buffalo	3.85c
Iron bars, Chicago	3.75c
Iron bars, Cleveland	3.95c
Iron bars, Detroit	3.75c
Iron bars, St. Louis	3.75c
Iron bars, Cincinnati	3.80c to 4.35c
Iron bars, Philadelphia	3.75c to 3.85c
Iron bars, New York	3.75c to 3.85c
Shapes, Chicago	4.00c
Shapes, Detroit	4.00c
Shapes, St. Louis	4.05c
Shapes, St. Paul	4.10c
Shapes, New York	4.10c
Shapes, Cleveland	4.10c
Shapes, Philadelphia	4.10c
Shapes, Buffalo	3.95c
Shapes and plates, Cincinnati	4.10c to 5.00c
Plates, Chicago	4.75c
Plates, Detroit	4.75c
Plates, St. Louis	4.80c
Plates, St. Paul	4.85c
Plates, New York	5.15c
Plates, Cleveland	5.00c
Plates, Philadelphia	5.25c
No. 10 blue anl. sheets, Chicago	5.25c
No. 10 blue anl. sheets, Clevel'd	5.00c
No. 10 blue anl. sheets, Buffalo	4.50c
No. 10 blue anl. sheets, St. L.	5.30c
No. 10 blue anl. sheets, Cinci.	5.25c
No. 10 blue anl. sheets, St. Paul	5.35c
No. 10 blue anl. sheets, Detroit	5.25c
No. 28 black sheets, Chicago	5.40c
No. 28 black sheets, Cleveland	5.50c
No. 28 black sheets, Cincinnati	5.50c
No. 28 black sheets, Detroit	5.40c
No. 28 black sheets, St. Louis	5.45c
No. 28 black sheets, St. Paul	5.50c
No. 28 galv. sheets, Chicago	7.50c
No. 28 galv. sheets, Cleveland	7.00c
No. 28 galv. sheets, Cincinnati	7.50c
No. 28 galv. sheets, Detroit	7.50c
No. 28 galv. sheets, St. Louis	8.00c
Hoops, Cleveland	5.00c
Hoops, Detroit	4.50c

Coke Oven By-Products

Spot.

Per Gallon at Producers Plant.

Pure benzol	$0.55 to .60
Toluol	1.75 to 2.00
Solvent naphtha	.18 to .23

Per Pound at Producers Plant.

Phenol	$0.45 to .50

Per 100 Pounds at Seaboard.

Sulphate of ammonia	$4.30 to 4.35

Contract.

Per Gallon at Producers Plant.

Pure benzol	$0.55 to .60
Toluol	1.75
Solvent naphtha	.16 to .20

Per Pound at Producers Plant.

Phenol (nominal)	$0.45 to .50

Per 100 Pounds at Seaboard.

Sulphate of ammonia	no market

IRON AND STEEL SCRAP

(Net Tons.)

Angle bars, iron, Chicago	$27.25 to 27.75
Angle bars, steel, St. Louis	21.50 to 22.00
Arch bars and transoms, St. L.	27.50 to 28.00
Arch bars and transoms, Chgo.	27.50 to 28.00
Cast, No. 1, St. Louis	15.00 to 15.50
Boiler plate, cut, No. 1, Chgo.	13.00 to 13.50
Boiler plate, cut, No. 1, St. L.	13.00 to 13.50
Boiler punchings, Chicago	20.00 to 21.00
Bundled sheet, Cincinnati	12.50 to 13.00
Busheling, No. 1, Chicago	16.50 to 17.00
Busheling, No. 1, Cincinnati	14.00 to 14.50
Busheling, No. 1, Cleveland	17.50 to 18.00
Busheling, No. 1, St. Louis	16.00 to 16.50
Busheling, No. 2, Chicago	12.25 to 12.75
Cast borings, Cincinnati	8.00 to 8.50
Cast borings, Cleveland	8.75 to 9.00
Cast borings, St. Louis	8.50 to 9.00
Cast borings, Chicago	9.25 to 9.75
Cast, No. 1, Chicago	16.50 to 17.00
Cast, No. 1, Cincinnati	16.00 to 16.50
Cast, No. 1, Cleveland	17.00 to 17.50
Cast, No. 1, St. Louis	15.00 to 15.50

Freight Rates, Finished Material

From Pittsburgh, carloads, per 100 lbs. to:—

New York	16.9 cents
Philadelphia	15.9 cents
Boston	18.9 cents
Buffalo	11.6 cents
Baltimore	15.4 cents
Cleveland	10.5 cents
Cincinnati	15.8 cents
Chicago	18.9 cents
Detroit	15.7 cents
Minneapolis and St. Paul	32.9 cents
Denver	83.6 cents
St. Louis	23.6 cents
New Orleans	30 cents
Birmingham	45 cents
Pacific coast (all rail)	73.9 cents
Pacific coast (tin plate)	70 cents
Pacific coast, via Panama canal	61.9 cents

Cut forge, Chicago	23.75 to 24.25
Grate bars, Cleveland	12.00 to 12.50
Iron axles, St. Louis	34.00 to 34.50
Iron axles, Cleveland	43.00 to 44.00
Knuckles, coup., Chicago	22.50 to 23.00
Knuckles, coup., St. Louis	24.00 to 24.50
Locomotive tires, Chicago	31.00 to 31.50
Locomotive tires, St. Louis	31.00 to 31.50
Machine shop turnings, Chicago.	9.00 to 9.50
Machine shop turnings, Cleveland	8.75 to 9.00
Machine shop turn'gs, Cincinnati	8.00 to 8.50
Machine shop turn'gs, St. Louis.	9.25 to 9.75
Malleable agricultural, Chgo.	14.50 to 15.00
Malleable agricultural, St. Louis	15.50 to 16.00
Malleable, Cincinnati	12.50 to 13.00
Malleable railroad, Chicago	17.25 to 17.75
Malleable railroad, St. Louis	16.00 to 16.50
Pipes and flues, Cleveland	14.75 to 15.25
Pipes and flues, Chicago	14.00 to 14.50
Pipes and flues, St. Louis	14.50 to 15.00
Railroad wrought, No. 1, Cleve.	25.00 to 25.50
Railroad wrought, No. 1, Chgo.	25.00 to 25.50
Railroad wrought, No. 1, Cinci.	19.00 to 20.00
Railroad wrought, No. 1, St. L.	25.00 to 25.50
Railroad wrought, No. 2, Chgo.	23.75 to 24.25
Railroad wrought, No. 2, St. L.	24.00 to 24.50
Shafting, St. Louis	24.50 to 25.00
Springs, Chicago	23.50 to 24.00
Steel car axles, St. Louis	35.00 to 35.50
Steel car axles, Chgo.	35.00 to 36.00
Stove plate, Chicago	12.00 to 12.50
Stove plate, Cleveland	12.25 to 13.00
Stove plate, Cincinnati	10.50 to 11.00
Stove plate, St. Louis	11.50 to 12.00

(Gross Tons.)

Axle turnings, Cleveland	$16.50 to 16.75
Axle turnings, Buffalo	17.50 to 18.00
Busheling, No. 1, Buffalo	20.50 to 21.50
Busheling, No. 1, Pittsburgh	16.50 to 17.25
Busheling, No. 2, Buffalo	13.00 to 13.50
Bundled sheets, Pittsburgh	15.00 to 16.00
Bundled sheets, Cleveland	14.50 to 15.00
Bundled sheets, Buffalo	14.00 to 14.50
Bundled tin, Buffalo	13.50 to 14.00
Car wheels, (iron), Pittsburgh	21.00 to 21.50
Car wheels, (steel), Pittsburgh	27.00 to 28.00
Car wheels, Chicago	18.50 to 19.00
Car wheels, eastern Pa	20.50 to 21.50
Car wheels, Buffalo	23.00 to 23.50
Car wheels, New York	19.00 to 20.00
Car wheels, St. Louis	19.00 to 19.50
Car wheels, Birmingham	15.00 to 15.50
Car wheels, Cleveland	19.00 to 19.50
Tram car wheels, Birmingham	14.50 to 15.00
Cast borings, New York	11.50 to 12.00
Cast borings, eastern Pa	13.50 to 14.00
Cast borings, Buffalo	11.00 to 11.50
Cast borings, Pittsburgh	12.00 to 12.50
Cast, No. 1, eastern Pa	21.00 to 22.00
Cast, No. 1, Pittsburgh	20.00 to 22.00
Cast, No. 1, Birmingham	16.00 to 17.00
Cast, heavy, No. 1, N. J. points	20.00 to 20.50
Drop forge flashings, und. 10 in.	19.50
Drop forge flashings, ov. 10 in.	17.00
Forge, No. 1, eastern Pa	15.00 to 15.50
Frogs, switches, guards, St. L.	22.50 to 23.00
Grate bars, Buffalo	15.00 to 15.50
Grate bars, N. J. points	13.50 to 14.00
Heavy axle turnings, Buffalo	16.00 to 16.50
Heavy melting steel, Pittsburgh	22.50 to 23.50
Heavy melting steel, Buffalo	25.50 to 26.50
Heavy melting steel, Chgo	22.00 to 22.50
Heavy melting steel, Cleveland	22.00 to 22.50
Heavy melting steel, Cincinnati	19.50 to 21.00
Heavy melting steel, eastern Pa	21.50 to 22.50
Heavy melting steel, New York	19.50 to 20.50
Heavy melting steel, St. L	23.00 to 24.00
Heavy melting steel, Birmingham	15.00 to 16.00
Hydraulic pressed sheet, Clevel'd	18.00 to 18.50
Hydraulic pressed sheets, Pbgh	18.50 to 19.00
Hydraulic pressed sheets, Chgo	14.50 to 15.00
Iron rails, Chicago	27.50 to 28.00
Iron rails, Buffalo	25.00 to 26.00
Iron rails, Cincinnati	24.00 to 25.00
Iron rails, St. Louis	27.00 to 27.50
Iron rails, Cleveland	29.00
Iron axles, Pittsburgh	39.00 to 41.00
Iron axles, Cincinnati	40.00 to 41.00
Iron axles, eastern Pa	38.00 to 40.00
Iron axles, Chicago	38.00 to 39.00
Iron axles, Buffalo	45.00
Low phos. steel, Buffalo	32.00 to 36.00
Low phos. steel, Pittsburgh	32.00 to 35.00
Low phos. steel, eastern Pa	31.00 to 32.00
Machine shop turnings, Buffalo	11.00 to 11.50
Mch. shop turnings, New York	10.75 to 11.25
Mch. shop turnings, Pittsburgh	11.75 to 12.25
Mch. shop turnings, eastern Pa	12.75 to 13.25
Mch. shop turnings, Birmingham	8.00 to 8.50
Malleable railroad, Cleveland	20.50 to 21.00
Malleable railroad, Buffalo	22.00 to 23.00
Malleable railroad, Pittsburgh	21.00 to 21.25
Malleable railroad, eastern Pa	16.50 to 17.00
R. R. and mch. cast, No. 1, Bfl.	22.50 to 23.00
R. R. wrought, No. 1, Buffalo	30.00 to 31.00
R. R. wrgt., No. 1, eastern Pa.	27.00 to 27.50
City wrought, New York	19.00 to 20.00
R. R. wrought, No. 1, Pbgh	23.00
R. R. wrought, No. 1, B'ham	18.00 to 19.00
Reroll. rails, 5 ft. & over, Pbgh.	28.00 to 30.00
Reroll. rails, 5 ft. & ov., Chgo.	26.50 to 27.50
Reroll. rails, 5 ft. & ov., E. Pa.	27.00 to 28.00
Reroll. rails, 5 ft. and ov., St. L.	26.50 to 27.00
Shafting, New York	25.00 to 25.50
Shafting, eastern Pa	27.00 to 28.00
Shoveling steel, Chgo	18.75 to 19.25
Shoveling steel, St. Louis	18.50 to 19.00
Steel rails, short, Chicago	23.75 to 24.25
Steel rails, short, Cleveland	23.50 to 24.00
Steel rails, over 6 ft., Cleveland.	20.50 to 21.50
Steel rails, old, Birmingham	18.00 to 18.50
Steel rails, short, St. Louis	25.00 to 25.50
Steel car axles, Birmingham	35.00 to 36.00
Steel car axles, New York	40.00 to 42.00
Steel car axles, Buffalo	45.00
Steel car axles, Cleveland	49.00 to 50.00
Steel car axles, Pittsburgh	39.00 to 41.00
Steel car axles, eastern Pa	41.00 to 43.00
Stove plate, N. J. points	14.00 to 14.50
Stove plate, Birmingham	11.00 to 12.00
Stove plate, Buffalo	14.00 to 14.50
Stove plate, eastern Pa	16.00 to 17.00
Stove plate, Pittsburgh	15.00 to 15.50
Wrought pipe, Buffalo	16.00 to 16.50
Wrought pipe, eastern Pa	17.75 to 18.25
Wrought pipe, New York	15.75 to 16.25

"Where-To-Buy"

A classified-by-products list of advertisers for the convenience of readers. If you don't find what you want, write us and we will tell you where to get it. ¶ Index to advertisements will give you page number of any advertiser and by referring to advertisement you can get full particulars about products.

ACCUMULATORS.

Biggs-Watterson Co., The, Cleveland, O.
Birdsboro Steel Fdy. & Mch. Co., Birdsboro, Pa.
Chambersburg Engrg. Co., Chambersburg, Pa.
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
Mesta Machine Co., Pittsburgh, Pa.
Southwark Fdy. & Mch. Co., Philadelphia, Pa.
Tod, Wm., Youngstown, O.
United Engrg. & Fdy. Co., Pittsburgh, Pa.
Wood, R. D., & Co., Philadelphia, Pa.

ACETYLENE IN CYLINDERS.

Linde Air Products Co., New York City.
Oxweld Acetylene Co., Chicago, Ill.
Prest-O-Lite Co., The, Indianapolis, Ind.

ADAMITE ROLLS.

Pittsburgh Iron & Steel Foundries Co., Pittsburgh, Pa.

AEROPLANE WIRE, STRAND AND CORD.

American Steel & Wire Co., Chicago, Ill.
Roebling's, John A., Sons Co., Trenton, N. J.

ALLOYS.

American Vanadium Co., Pittsburgh, Pa.
Bethlehem Steel Co., The, So. Bethlehem, Pa.
Blackwell, Geo. G., Sons & Co., Ltd., Liverpool, Eng.
Bourne-Fuller Co., The, Cleveland, O.
Carnegie Steel Co., Pittsburgh, Pa.
Central Steel Co., The, Massillon, O.
Haynes Stellite Co., The, Kokomo, Ind.
Standard Alloys Company, Pittsburgh, Pa.
Titanium Alloy Mfg. Co., Niagara Falls, N. Y.
United Alloys Steel Corp., The, Canton, O.

ALUMINUM (Granulated).

United Smelt'g & Alum. Co., New Haven, Ct.

ALUMINUM (Solder).

United Smelt'g & Alum. Co., New Haven, Ct.

ALUMINUM (Vanadium).

American Vanadium Co., Pittsburgh, Pa.

ALUMINUM ALLOYS.

United Smelt'g & Alum. Co., New Haven, Ct.

ALUMINUM INGOTS.

United Smelt'g & Alum. Co., New Haven, Ct.

ALUMINUM RODS (Sheet).

United Smelt'g & Alum. Co., New Haven, Ct.

ANGLES, TEES, CHANNELS (See Steel, Structural).

ANNEALING BOXES AND POTS.

Blackwood Steel Fdy. Co., The, Springfield, O.
Knox Pressed & Welded Steel Co., Pittsburgh.
Mesta Machine Co., Pittsburgh, Pa.
Pittsburgh Annealing Box Co., Pittsburgh, Pa.
Pittsburgh Malleable Iron Co., Pittsburgh, Pa.
Pittsburgh Valve Foundry & Const. Co., Pittsburgh, Pa.
Swedish Crucible Steel Co., Detroit, Mich.
United Engrg. & Foundry Co., Pittsburgh, Pa.
Zanesville Malleable Iron Co., Zanesville, O.

ANTI-SLIP TREADS FOR STAIRS.

Pittsburgh Iron & Steel Foundries Co., Pittsburgh, Pa.

ARCHITECTURAL SHAPES.

Empire Art Metal Co., College Pt., N. Y.

ARMATURES.

General Electric Co., Schenectady, N. Y.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

ASH BUCKETS.

Lakewood Engrg. Co., Cleveland, O.

AUTO TOWING CABLES.

American Steel & Wire Co., Chicago, Ill.

AUTO TRUCKS.

Federal Motor Truck Co., Detroit, Mich.

AXLES.

American Bridge Co., New York City.
American Steel Export Co., New York City.
Bethlehem Steel Co., The, So. Bethlehem, Pa.
Cambria Steel Co., Philadelphia, Pa.
Camden Forge Co., Camden, N. J.
Carnegie Steel Co., Pittsburgh, Pa.
Illinois Steel Co., Chicago, Ill.
Lockhart Iron & Steel Co., Pittsburgh, Pa.
National Tube Co., Pittsburgh, Pa.
Otis Steel Co., Cleveland, O.

AXLE LATHES.

Bridgeford Mch. Tool Wks., Rochester, N. Y.

BABBITT METAL.

Keystone Bronze Co., Pittsburgh, Pa.
Lubricating Metal Co., The, New York City.
Ryerson, Jos. T., & Son, Chicago, Ill.

BAKERS, WIRE COATING.

Morgan Construction Co., Worcester, Mass.
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

BALE TIES.

American Steel & Wire Co., Chicago, Ill.

BALLS (Steel).

Bethlehem Steel Co., The, So. Bethlehem, Pa.
New Departure Mfg. Co., Bristol, Conn.

BANDERS (Hydraulic for Projectiles).

Southwark Foundry & Mach. Co., Philadelphia.
West Tire Setter Co., The, Rochester, N. Y.

BANDS (Steel).

Akron-Selle Co., The, Akron, O.
Carnegie Steel Co., Pittsburgh, Pa.

BARGES (Steel).

American Bridge Co., New York City.

BARRELS, TUMBLING (Wire Nails).

Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

BARS (Concrete Reinforcing).

Bourne-Fuller Co., Cleveland, O.
Carnegie Steel Co., Pittsburgh, Pa.
Cincinnati Iron & Steel Co., Cincinnati, O.
Franklin Steel Works, Franklin, Pa.
Inland Steel Co., Chicago, Ill.
Laclede Steel Co., St. Louis, Mo.
Ryerson, Jos. T., & Son, Chicago, Ill.
Trussed Concrete Steel Co., Detroit, Mich.
Upson Nut Co., Cleveland, O.
Witherow Steel Co., Pittsburgh, Pa.

BARS (Iron and Steel).

American Bridge Co., New York, N. Y.
American Iron & Steel Mfg. Co., Lebanon, Pa.
American Steel Export Co., New York City.
Belmont Iron Works, Philadelphia, Pa.
Bethlehem Steel Co., The, So. Bethlehem, Pa.
Bingham, W., Co., The, Cleveland, O.
Bourne-Fuller Co., Cleveland, O.
Brown-Wales Co., Boston, Mass.
Cambria Steel Co., Philadelphia, Pa.
Camden Forge Company, Camden, N. J.
Carnegie Steel Co., Pittsburgh, Pa.
Cincinnati Iron & Steel Co., Cincinnati, O.
Franklin Steel Works, Franklin, Pa.
Harvey, Arthur C., Co., Boston, Mass.
Illinois Steel Co., Chicago, Ill.
Illinois Steel Co., Warehouse Dept., Chicago.
Illinois Steel Warehouse Co., St. Louis, Mo.
Illinois Steel Warehouse Co., St. Paul, Minn.
Inland Steel Co., Chicago, Ill.
Jones & Laughlin Steel Co., Pittsburgh, Pa.
Lackawanna Steel Co., Buffalo, N. Y.
Lockhart Iron & Steel Co., Pittsburgh, Pa.
Milton Mfg. Co., Milton, Pa.
Republic Iron & Steel Co., Youngstown, O.
Ryerson, Joseph T., & Son, Chicago, Ill.
Scully Steel & Iron Co., Chicago, Ill.
Standard Gauge Steel Co., Beaver Falls, Pa.
Tennessee Coal, Iron & R. R. Co., Birmingham, Ala.
Trussed Concrete Steel Co., Detroit, Mich.
United Alloys Steel Corp., The, Canton, O.
Upson Nut Co., Cleveland, O.
Westerman & Co., Lockport, N. Y.

BEAMS, CHANNELS AND ANGLES.

American Steel Export Co., New York City.
Belmont Iron Works, Philadelphia, Pa.
Bourne-Fuller Co., Cleveland, O.
Carnegie Steel Co., Pittsburgh, Pa.
Empire Art Metal Co., College Pt., N. Y.
Franklin Steel Works, Franklin, Pa.
Illinois Steel Co., Chicago, Ill.
Ryerson, Joseph T., & Son, Chicago, Ill.
Scully Steel & Iron Co., Chicago, Ill.

BEARINGS (Ball).

New Departure Mfg. Co., Bristol, Conn.

BEARINGS (Vanadium Steel).

American Vanadium Co., The, Pittsburgh, Pa.

BELT CEMENT AND DRESSING.

Dixon, Jos., Crucible Co., Jersey City, N. J.
Graton & Knight Mfg. Co., Worcester, Mass.
Texas Company, The, New York City.

BELT LACING (Leather).

Chicago Rawhide Mfg. Co., Chicago, Ill.
Graton & Knight Mfg. Co., Worcester, Mass.

BELTING (Chain).

Link-Belt Company, Chicago, Ill.

BELTING (Leather).

Bingham, W., Co., The, Cleveland, O.
Chicago Rawhide Mfg. Co., Chicago, Ill.
Graton & Knight Mfg. Co., Worcester, Mass.

BENCHES (Steel).

New Britain Mach. Co., New Britain, Conn.

BENCHES AND FRAMES (Drawing).

Morgan Construction Co., Worcester, Mass.
Turner, Vaughn & Taylor Co., The, Cuyahoga Falls, O.

BENDING AND STRAIGHTENING MACHINES.

Abramsen Engrg. Co., Pittsburgh, Pa.
Bertsch & Co., Cambridge City, Ind.
Birdsboro St'l Fdy. & Mch. Co., Birdsboro, Pa.
Cleveland Punch & Shear Works Co., Cleveland, O.
Espen-Lucas Machine Works, Philadelphia, Pa.
Hinman, D. A., & Co., Sandwich, Ill.
Lourie Mfg. Co., Springfield, Ill.
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
Niles-Bement-Pond Co., New York, N. Y.
United Engrg. & Fdy. Co., Pittsburgh, Pa.

See Index to Advertisements for Pages Containing Advertisements of Companies Listed Above